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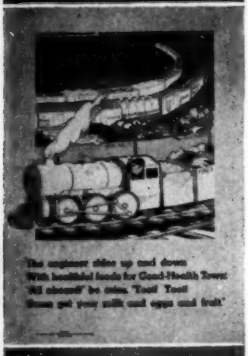

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THE Journal OF THE
AMERICAN DENTAL ASSOCIATION

FEBRUARY 1948 • VOLUME 36 • NUMBER 2

TEMPOROMANDIBULAR ARTICULATION IN MANDIBULAR OVERCLOSURE

Harry Sicher, M.D., Chicago

IN AN article on diagnosis and treatment of disturbances of the temporomandibular joint, L. S. Block[1] gives an "anatomic explanation of pain." In this section one reads that "during chewing or swallowing movements, the condyle may exert pressure on or near the auriculotemporal nerve which passes close to the mesial side of the capsule and between the condyle and the tympanic plate. . . ." The condyle is described as sometimes "impacting and eroding the tympanic plate. The chorda tympani nerve passes this spot through the iter chordae anterius at the medial end of the petrotympanic fissure" to traverse the glenoid fossa. "Deep erosion of the bone of the glenoid cavity leaves only a thin plate between the condyles and the dura. . . . It is therefore quite possible that dull vertex pain from this source may be of dural origin, that pain over the temporal region originates in irritation of the auriculotemporal nerve and that pain referred to the side of the tongue may be attributed to pressure on the chorda tympani nerve."

Stuffiness of the ear and dizziness are explained as resulting from a compression of the eustachian tube by soft tissue piling against the tube, if the internal pterygoid muscle "relaxes" during marked overclosure of the jaws.

In his summary Block writes that "the anatomic explanations are sound and have been repeatedly proved." It can be stated unequivocally that the anatomic explanations quoted by the author are entirely unsound. They have been repeated often enough, but nobody has as yet, to the best of my knowledge, tried to check their validity. The anatomic rationalization of Costen's syndrome is based in part on interpretation and elaboration of statements found in one or the other textbook of anatomy, and in part it seems to be derived from the inspection of anatomic specimens without any consideration for the different behavior of tissues, especially muscles, in the cadaver and in the living person.

Even a superficial study of original anatomic literature would have convinced

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1. Block, L. S., Diagnosis and Treatment of Disturbances of the Temporomandibular Joint Especially in Relation to Vertical Dimension. *J.A.D.A.* 34:933 (February 15) 1947.

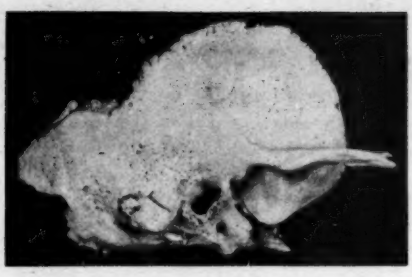

Fig. 1.—Right temporal bone of a 4 year old child. Note the defect in the tympanic plate

the various authors that a textbook is necessarily a condensed and abbreviated record of our knowledge in any field. To use a brief statement from a textbook as the basis for far-reaching conclusions means a return to medieval scholasticism. Only the dissection of the cadaver can serve as a basis for applied anatomy, because the specific question confronting the practitioner may never have arisen before and an applicable anatomic answer may not have been given as yet. Even a detailed anatomic description cannot include all the details and views which some day may gain an importance they never seemed to have had before. In view of the fact that uncritical repetition of "anatomic facts" is mistaken for confirmation, it is imperative to describe the true relations of the temporomandibular articulation from the point of view of Costen's syndrome.

Tympanic Bone and Postglenoid Process

Defects in the floor of the bony acoustic meatus are found in about 20 per cent of all persons. Almost all of these defects owe their existence to an arrest of the development of the tympanic bone. The tympanic ring of the newborn, a narrow C-shaped frame for the dense part of the ear drum, changes to the tympanic plate by the development of two irregular processes which grow laterally and fuse at their ends. Thus a bony foramen is bounded, and this opening narrows gradually and closes sometime between the end of the second and the fifth year (Fig. 1). Even then the former location of the foramen can be recognized as the thinnest region of the tympanic plate, facing the mandibular fossa. According to the best statistical investigations, the foramen persists in slightly more than 19 per cent of all persons. This foramen, of course, has no relation to any changes in the temporomandibular articulation.

Defects of the tympanic bones which are situated farther laterally and superiorly are encountered rarely. They are found only in rather old edentulous skulls. Although such openings could be caused by pressure of the posteriorly displaced condyle, it is not always possible to establish this connection. At the age at which these "erosions" have been seen, senile osteoporosis is frequent and involves wide regions of the skull, as, for instance, the temporal fossa and the orbital roof. Even if all defects in the lateral part of the tympanic plate are considered as caused by articular changes, this condition is extremely rare, is restricted to the oldest age group and cannot in any way be related to disturbances of hearing.

In an evaluation of the possibility of tympanic erosion, the presence of the postglenoid or posterior articular process of the temporal bone should not be forgotten. It forms the posterior wall of the articular fossa in its lateral part as a bony ridge projecting downward from the squama of the temporal bone in front of the tympanic bone. This ridge gains in height and thickness as it extends laterally and appears in profile view as a cone-shaped process between the articular fossa and the border of the external acoustic opening. Although somewhat variable in size, the postglenoid process is absent in only a few skulls.

The common description of the mandibular fossa as being bounded posteriorly by the tympanic bone is therefore entirely inaccurate. Any posterior displacement of the condyle will be directed first

against the postglenoid process, and only the destruction of the postglenoid process could open the way for the condyle "impacting and eroding the tympanic plate."

Roof of Articular Space

The bone separating the articular fossa from the middle cranial fossa is normally quite thin (Fig. 2). Its extreme thinness is indicated by its translucency. The thin region is evidently never under pressure. In occlusal position the thickest part of the articular disk fills the deepest part of the articular fossa, and the resultant force of the masticatory muscles is directed upward and forward, so that the condyle presses the thinnest central part of the disk against the posterior slope of the articular tubercle. The mandible is arrested in this position by the occluding teeth if they are normal in number, shape and position. Only the crest and the posterior slope of the articular tubercle are covered by a thick fibrous or fibrocartilaginous layer, and the fossa is lined by simple periosteum. The extent of the pressure bearing area is thus easily ascertained (Fig. 2).

That masticatory pressure prior to the establishment of occlusal contact does not lead to pressure in an upward and backward direction is not immediately obvious. From a general knowledge of muscle physiology it has to be assumed that the external pterygoid muscle is actively contracted during the closing phase, assuring a balanced position of the mandible and preventing an exaggerated retrusion of the condyle. In normal mastication the translatory forward movement of the mandible is negligible or small because of the restricted opening of the jaws. The forward movement of the mandible and disk is pronounced only in extreme opening movements, which do not occur during normal mastication. Forceful closure of the jaws from a moderate opening position, as occurs in hard chewing, starts therefore with the disk and the condyle in or almost in their posterior positions.

Even in lateral movement in normal mastication the forward excursion of the moving condyle is far from extreme, and greater force is applied only on the side of the resting condyle. (The terms "moving" and "resting" condyle are of course applied for shortness.)

These observations make it also improbable that in cases of closed bite the abnormal position of the condyle is due

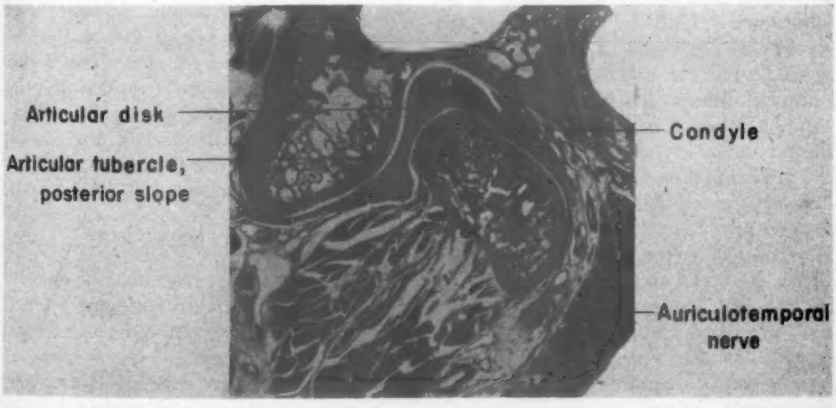

Fig. 2.—Sagittal section through a normal temporomandibular articulation of a 28 year old man (courtesy S. W. Chase, Western Reserve University)

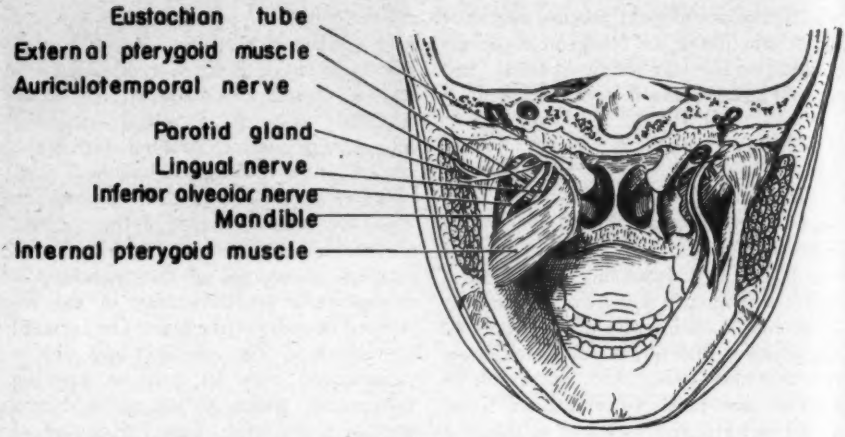

Fig. 3.—Temporomandibular articulation, posterior view

simply to an unchecked gliding of the condyle posteriorly and superiorly.

Auriculotemporal Nerve

The auriculotemporal nerve is widely described as passing between the mandibular condyle and the tympanic plate on its way from the infratemporal fossa into the face. This description is entirely inaccurate. It could persist in the literature only because the true relations of the nerve are not easily established by the dissecting technic routinely used in the laboratories. Only if the nerve is dissected either from the medial side or from behind while the mandible and the temporomandibular articulation are intact can the relation between the nerve and the mandible be elaborated exactly. Then the following facts are obvious. The nerve runs posteriorly from the oval foramen and slightly downward on the inner surface of the external pterygoid muscle (Figs. 3-6) and reaches the mandibular neck below the insertion of the external pterygoid muscle. The auriculotemporal nerve crosses the posterior border of the mandible at a level below the insertion of the capsule to the mandible and also below the level of the tympanic bone (Fig. 2). The nerve then divides into a superior and an inferior branch. The first branch, following the superficial temporal artery, supplies the skin in the temporal region and that of part of the outer ear, the articular capsule and the parotid gland; the latter, joined to branches of the facial nerve, supplies the skin of the cheek, commonly described as being supplied by the (long) buccal nerve.

The position of the auriculotemporal nerve leaves no doubt that it can never be impinged upon in any malposition of the mandible. It can, however, be involved in fractures of the mandibular neck. Pain in regions supplied by the auriculotemporal nerve is therefore always referred pain and is not caused by direct involvement of the nerve or of one of its branches.

Chorda Tympani Nerve

Some textbooks give only a sketchy description of the extratympanic part of the chorda tympani, although the details of its course are well known. It is rather interesting that only the misleading descriptions are quoted and used as support of hypothetical statements.

The chorda tympani leaves the tympanic cavity through a narrow canal, iter chordae anterius, which is situated in the primary petrotympanic fissure. The outlet is found behind the posterior attachment of the capsule approximately between its middle and medial third. From this point on the delicate nerve continues in the depth of the petrotympanic fissure to its medial end, well protected from any external pressure. Then the chorda tympani turns anteriorly around the downward projecting inner end of the articular fossa, which leans on, and is joined to, the angular spine of the sphenoid bone. The nerve passes the angular spine itself, often in a narrow horizontal groove on the medial surface of the spine. Thus the chorda tympani is first in a deep and narrow groove behind the temporomandibular capsule and then is separated from the capsule by the bony borders of the mandibular fossa. Once the chorda tympani has passed the angular spine it is in the sagittal plane of the oval foramen. Coursing downward and forward the chorda crosses the lower alveolar nerve on its medial side to join the lingual nerve.

Although the course of the chorda tympani makes it abundantly clear that the chorda tympani is out of reach of the condyle even in extreme malposition, it is worth mentioning that the composition of the chorda tympani is such that pressure on it could hardly explain symptoms of pain. Pain is received and conducted in specialized nerves. The chorda tympani does not contain such fibers but is composed of taste fibers for the anterior region of the tongue and of parasympathetic preganglionary fibers of secretory nature for submaxillary, sublingual and anterior lingual glands and several smaller glands of the oral cavity.

Eustachian Tube

For a long time symptoms of disorders of the ear have been correlated with a "loss of vertical dimension." Although it soon became obvious that most of the patients of this group suffered from disturbances of the inner ear which are in no way related to changes in the mandibular joint, stuffiness in the middle ear and dizziness are still enumerated as symptoms of Costen's syndrome. It is necessary to examine the anatomic and physiologic basis for these complaints because of the confusion existing in the literature.

Three possibilities have to be considered: (1) pain in the ear and about the ear; (2) stuffiness and pain during changes of altitude, especially during

Fig. 4.—Photograph of the left temporomandibular articulation. Note the relation of the auriculotemporal nerve to the neck of the mandible

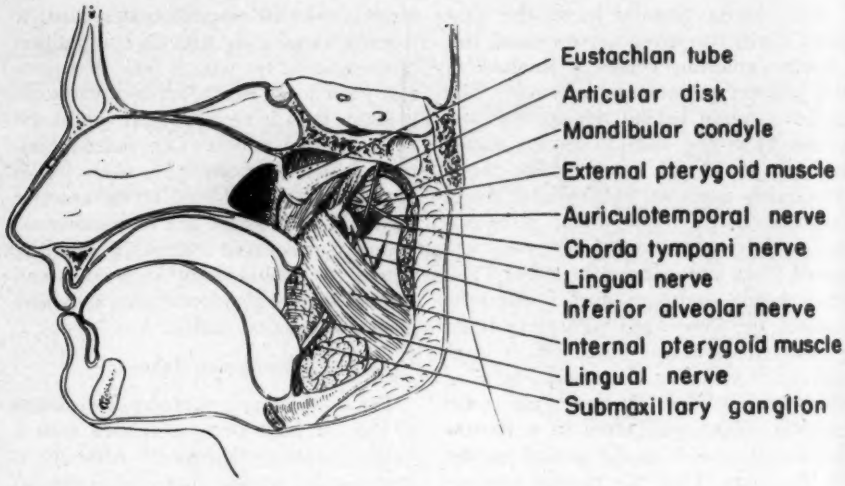

Fig. 5.—Infratemporal fossa, medial view

flying, and (3) stuffiness under normal conditions, that is, without change of altitude.

That pain in the ear is often referred pain needs no amplification. There is a possibility of a link between such referred pain and mandibular overclosure. Under nervous strain people sometimes clamp their teeth so strongly that the contraction of the masticatory muscles leads to contractures or cramps of these muscles which are extremely painful. It is quite possible that such pain is then referred to the ear. Stretching of cramped muscles relieves cramp and pain. Bite plates may therefore be helpful in relieving the pain in the ear in such cases, especially if the contracture is partly induced by an overclosure and thus by a primarily abnormal shortening of the muscles which close the jaws.

The eustachian tubes, normally closed by a "collapse" of their anterolateral membranous wall, are opened by the action of the tensor palati muscle, which receives fibers from the membrane of the tube. This muscle is active during phonation and especially during swallowing. Its influence on the tube is incidental and is not regulated by a special reflex. We swallow so often during day and night that ample provision is made for the ventilation of the middle ear and the equalization of intratympanic and extratympanic pressure.

Human beings, destined by nature to live at ground level, but having learned to fly, have now to learn to ventilate the middle ear by voluntary and conscious action—swallowing—when the extratympanic pressure decreases in ascent or increases in descent. Failure to do so —for instance, under the mental strain of combat flying—leads to great stress on the ear drum and thus to pain. Pain in the ear in flyers is therefore often functional and has nothing to do with changes in the mandibular joint.

Lastly, there is the patient who complains of disturbances of the middle ear at ground level and presents at the same time a loss of vertical dimension of the face. The attempts to explain these symptoms as an impairment of the normal act of swallowing or as a compression of the tube by indirect pressure of

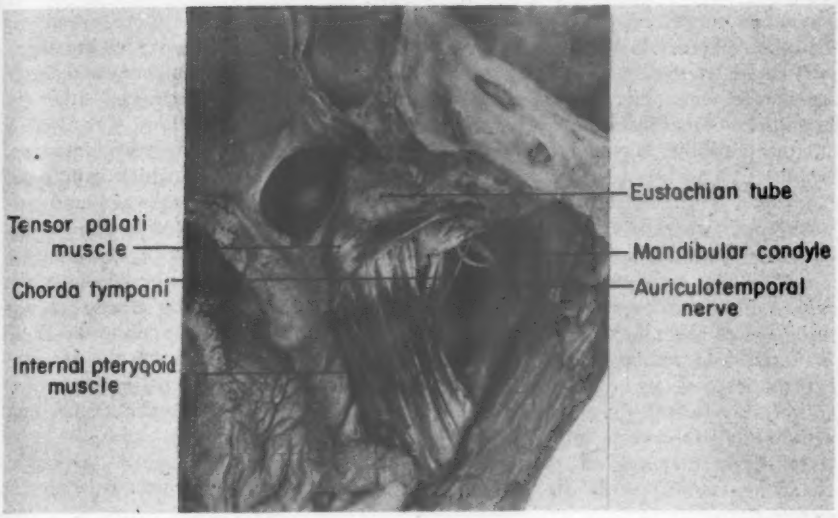

Fig. 6.—Photograph of infratemporal fossa. The angle is slightly different from that in Figure 5. Note the relations of the auriculotemporal nerve, the eustachian tube, the tensor palati muscle and the chorda tympani nerve

the overcontracted internal pterygoid muscle are entirely erroneous. The tensor palati, the muscle which opens the tube, extends in its fleshy part between the cranial base and the pterygoid hamulus, and its tendon extends into the palate where it is attached to the posterior border of the palatine bone. No change in the position of the lower jaw can influence this muscle to any measurable degree.

A piling of soft tissues against the tube by the "relaxing" internal pterygoid muscle is wholly impossible. This assumption rests on the observation of the pterygoid muscle in anatomic specimens. Here the muscle, once stretched, relaxes and folds considerably if the jaws are passively closed. In life the jaws are actively closed while the muscle *contracts.* It is also important to realize that the flesh of this muscle, which alone bulges during contraction, is restricted mainly to the middle two quarters of its length. The upper part, which is in close relation to the tensor palati and thus indirectly to the eustachian tube, is entirely tendinous and does not change its volume during contraction.

All these misleading deliberations would have been avoided if the authors had only taken cognizance of the fact that we swallow more often with the lower jaw in rest position than in occlusal position and it is only with the jaws in occlusal position that overclosure of the jaws could exert any influence. Especially in drinking swallowing occurs while the jaws are slightly open. These acts of swallowing suffice fully to eliminate any differences in pressure in the middle ear at ground level.

Thus we have to realize that disturbances of the middle ear, if really related to closed bite (the observations are still controversial), can be explained only as resulting from an obstruction of the eustachian tube itself, so that the tensor tympani muscle, although contracting normally, is not able to open the tubal lumen. Such an obstruction conceivably could be caused by a lymphatic

or venous congestion of the mucosa of the tube. Whether the overclosure of the jaws could interfere with the free drainage of the region between and around the muscles of mastication is questionable, but the possibility should be considered.

Mandibular Overclosure

Although a direct connection between loss of vertical dimension—a better term is mandibular overclosure—and in some cases mandibular displacement, and disturbances of the middle ear is still controversial and although the "anatomic explanation" of pain in these cases is entirely erroneous, these patients have definite subjective and objective symptoms. Early diagnosis of the articular changes is as important as the success of restorative procedure is undeniable.

A subjective symptom is pain referred from the region of the articulation into the temporal region, the ear, the neck, the tongue and sometimes the throat. Pain is often increased during mastication. Objective symptoms are cracking in the joint and, in advanced stages, roentgenologic signs of arthropathy. Necropsy material shows all the symptoms of a degenerative deforming osteo-arthritis: progressive destruction of the disk, of parts of the capsule and of the fibrous covering of the condyle and the articular tubercle and finally resorption as well as reactive proliferation of bone. The changes are mainly localized in the condyle and the articular tubercle, and the deepest part of the articular fossa is rarely involved. Flattening of the condyle as well as of the articular tubercle often can be observed after partial or total loss of the disk.

Clinical and pathologic findings make it abundantly clear that the basis for Costen's syndrome is a traumatic osteoarthritis deformans of the temporomandibular articulation. It is necessary and instructive to analyze the initial changes which end with the breakdown of the articulation.

After loss of teeth or tooth substance, occlusal contact of the remaining teeth or of the abraded and shortened teeth can, theoretically, be achieved either by an increase of the rotatory elevation of the lower jaw or by an exaggerated retrusion of the condyle which causes the whole jaw to move backward and upward. If excessive loss of teeth or tooth substance has occurred, a combination of both movements will be necessary. In preocclusal position the closing jaw is kept in balance on the posterior slope of the articular tubercle by the external pterygoid muscle, which contracts during the last phase of forceful closure and thus acts in combination with the masseter, temporal and internal pterygoid muscles. This is in accordance with the well known fact that in forceful movements antagonistic muscles or muscle groups act together, one group as movers, the other as stabilizers and brakes.

It is therefore logical to assume that a necessary overclosure is attempted by a rotatory movement, and a backsliding of the condyle and disk is primarily counteracted by the external pterygoid muscle. However, the exaggeration of the rotatory closing movement could bring the sharp anterior border of the condyle up against the disk and would overstretch the posterior fibers of the capsule, causing considerable pain. This is the moment when the external pterygoid muscle relaxes, and thus the precarious muscular balance which normally keeps condyle and disk on the posterior slope of the articular tubercle is destroyed. If the mandible is forcefully pulled backward and upward, the balanced position between condyle and disk is also lost, because the retracting muscles (the posterior part of the temporal muscle and the deep part of the masseter) are inserted to the mandible but not to the disk. This is in sharp contrast to the insertion of the protracting external pterygoid muscle to the mandible and the disk.

A forceful retraction of the mandible beyond the normal closing position will therefore primarily destroy the relation between condyle and disk, and then a vicious circle is initiated. The gradual destruction of the disk throws the entire mechanism of the articulation out of balance. It is mainly the gliding phase of the opening movement which will be impaired because the condyle is deprived of the guiding and balancing action of the disk; it is forcefully pulled against the posterior slope of the tubercle and has to jump this barrier instead of sliding over it. This is the reason why the most severe damage is seen on the mandibular condyle and the articular tubercle, which are gradually flattened to enable a sliding movement after loss of the disk. This, however, does not happen without restriction of the rotatory movement.

Summary

Most defects of the tympanic plate are caused by arrest of development of the tympanic bone.

The postglenoid process of the temporal squama forms the posterior bony wall of the articular fossa.

The deepest and thinnest region of the articular fossa is protected from pressure by the protracting action of the external pterygoid muscle during the preocclusal phase of forceful closing.

The auriculotemporal nerve crosses the neck of the mandible and therefore can never be compressed in a backward movement of the condyle

The extratympanic part of the chorda tympani nerve lies in the depth of the petrotympanic fissure and is further medially separated from the articular capsule by the angular spine of the sphenoid bone; it is thus well protected from any impingement by a displaced condyle.

The eustachian tube cannot be compressed during overclosure of the mandible; neither can the opening action of the tensor palati muscle on the tube be impaired in this condition.

The only possible influence of mandibular overclosure on the tube could be sought in an impairment of lymphatic and venous drainage and consecutive chronic swelling of the tubal mucosa.

The symptoms of mandibular overclosure start with a breakdown of muscular balance, followed by a loss of normal relations between condyle and disk and by an impairment of the forward sliding movement of the condyle and the disk on the articular tubercle.

The results are destruction of the disk and degenerative and proliferative changes on the condyle and tubercle under the well defined picture of deforming arthritis of traumatic origin.

The symptoms of pain, local and irradiating (referred), cracking of the joint and the restriction of movements of the joint are simply the symptoms of arthritis.

The term "Costen's syndrome" with all its implications should be replaced by the *diagnosis:* temporomandibular deforming arthritis from mandibular overclosure or displacement.

The beneficial influence of reconstructive dentistry has to be fully recognized.
—1757 West Harrison Street.

Bone Bank.—The success of the Bone Bank of the Hospital for Special Surgery, New York City, was reported by Dr. Philip D. Wilson, surgeon-in-chief of the hospital, at a meeting of the American College of Surgeons in September. Started in 1946, the Bone Bank has been useful especially in grafting for bone defects such as bone cyst, osteitis fibrosa cystica, fibrous dysplasia, and spine fusions.—*New York State J. Med. 47:2352, November 1, 1947.*

ADVANCES IN GENERAL ANESTHESIA: PENTOTHAL SODIUM AND CURARE

Philip E. Schultz,* M.D., and Walter C. Guralnick,† D.M.D., Boston

SINCE the celebration of the Morton Centennial in 1946, a discussion of recent advances in anesthesiology and their application to oral surgery is particularly timely. There is a marked improvement in application of the older anesthetics, owing to the development of endotracheal technics and controlled respiration, as well as in the availability of these improvements to the profession at large through the increasing number of qualified anesthetists. The past decade has been particularly productive. It has seen the introduction and popularization of a variety of agents and equipment, such as cyclopropane, Vinethene, Pentothal sodium, and the most recent adjunct to the anesthetist's armamentarium, curare. We shall deal briefly with all the agents, paying special attention to our methods of using Pentothal sodium in office and hospital practice.

Briefly stated, modern anesthesia has progressed from Wells' demonstration, in 1844, of nitrous oxide for dental extractions, and Morton's successful use of ether in 1846, to the present refined technics. In 1847 Snow, of London, developed the first inhaler to facilitate the administration of ether, and in 1868 Andrews advocated the addition of oxygen to nitrous oxide, beginning the gas-oxygen method so common in dental practice since that time. The turn of the century saw the gas-oxygen-ether combination generally accepted. Cotton and Boothby at the Boston City Hospital were the first to assemble an apparatus for this type of anesthesia. Gwathmey improved their machine, which has reached its present perfection in the accurately calibrated continuous flow apparatus used now. McKesson developed the intermittent flow machine which has functioned so well in many dental offices. In 1926 Ralph Waters[1,2] produced an absorber consisting of soda lime which removed carbon dioxide and thus made possible the first true rebreathing technic. By the removal of carbon dioxide an economy of gases was afforded as well as the retention of the patient's body heat and a close adherence to normal physiology.

Physiology

It would be well to review a few physiologic principles and their application to anesthesia. Oxygen is literally the breath of life; in its absence death occurs; and, with deviation from the minimal requirements, permanent damage to the central nervous system may take place.

At sea level a human being exists in an atmosphere of air containing 20 per cent of oxygen. Therefore, the partial pressure of outside oxygen is about 158 mm. of mercury. The partial pressure of the alveolar oxygen is normally about 100 mm. of mercury and this pressure is more than adequate to provide at least 95 per

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†Visiting oral surgeon, Metropolitan State Hospital, and assistant in dental surgery, Beth Israel Hospital, Boston.

1. Waters, R. M., Carbon Dioxide Absorption Technique in Anesthesia. *Ann. Surg.* 103:38 (January) 1936.
2. Waters, R. M., The Anesthetist's Point of View. *J.A.M.A.* 115:1687 (November 16) 1940.

cent saturation of hemoglobin with oxygen. Inhalation of a gas mixture containing less than 14 per cent of oxygen may give rise to toxic symptoms referable to the central nervous system, whose cells are particularly sensitive to deprivation of oxygen. An excessive concentration of carbon dioxide in the inhaled gas somewhat reduces the degree of saturation of hemoglobin with oxygen and may produce an acidotic state. The prime aim in the administration of all anesthetics is to maintain normal oxygen and carbon dioxide tensions in order to prevent those anesthetic accidents which might be caused by disturbances in the normal respiratory processes.

Anoxemia and Anoxia

Anoxemia and anoxia are terms which have been used rather loosely in the past to denote lack of oxygen. By definition they mean a deficiency of oxygen in the blood and in the tissue, thus producing a condition incompatible with life. (Waters has coined the words hypoxemia and hypoxia to define these same conditions.) There are four types of anoxia: anoxic, stagnant, anemic and histotoxic. The end result in all cases is cortical damage described by Courville[3] as petechial hemorrhage, edema and necrosis of the cells.

Anoxic anoxia is produced by respiratory obstruction, insufficient partial pressure of oxygen in the inspired atmosphere and diseases of the respiratory tract and alveoli, which inhibit the exchange of oxygen from the inspired atmosphere to the blood stream.

Stagnant anoxia is seen in congestive heart failure, in which condition the circulatory system is so sluggish that an adequate exchange of oxygen between the blood stream and the tissues is prevented.

In anemic anoxia, of which anemia is the prime example, there is an insufficient number of red cells or hemoglobin to transport the oxygen from the lungs to the tissues.

Histotoxic anoxia is a condition caused by direct poisoning, as from cyanide, which prevents the utilization by tissue cells of oxygen from the blood.

Hypoxia, like anesthesia, can produce unconsciousness as the result of inhalation of atmospheres containing less than 10 per cent of oxygen. The same effect is produced upon aviators exposed to rarefied mixtures who "black out" under these conditions. Whereas the insensitive state is relatively safe with anesthesia, it is not with hypoxia. Barach[4] is firmly convinced that percentages of oxygen below 14 should not be used under any circumstances and takes exception to Clement's[5] statements of the oxygen-nitrous oxide percentages in his saturation and supersaturation theory. Hypoxemia should not be used to enhance the action of any anesthetic agent, regardless of how innocuous the agent itself is to tissue cells.

Criteria

In order to fulfill the requirements of an ideal anesthetic agent the drug must meet the following criteria:

(1) It must be safe for the patient, a wide margin existing between an anesthetic dose and a toxic dose; (2) it should be controllable, in that its elimination can be facilitated in the presence of untoward symptoms; (3) the drug should be excreted unchanged from the body with minimum damage to the body during or after its use; (4) the agent should be 100 per cent potent in order to produce adequate relaxation while allowing complete oxygenation at all times, and (5) it should permit a quick and pleasant induction with a minimum of postoperative discomfort.

No agent completely fills these require-

3. Courville, C. B., Asphyxia as a Consequence of Nitrous Oxide Anesthesia. *Medicine* 15:109 (May) 1936.

4. Barach, A. L., and Rovenstine, E. A., Hazard of Anoxia During Nitrous Oxide Anesthesia. *Anesthesiology* 6:449 (September) 1945.

5. Clement, F. W., *Nitrous Oxide-Oxygen Anesthesia*. Philadelphia: Lea & Febiger, 1945.

ments. Nitrous oxide, except for its lack of potency and its narrow margin for aeration, comes very close. Pentothal sodium by intravenous injection is an almost completely controllable agent. From present indications, although it might be expected that the ideal agent would be a gas, anesthetics administered intravenously seem to offer great potentiality.

Anesthetic Agents

In a discussion of anesthetic agents and technics for oral surgery, important considerations are the safety of the patient, the time factor, the position of the patient, the disease being treated, exposure of the field, control of secretions and airway, and postoperative recovery. The various anesthetic agents and methods of their use will be considered with these points in mind.

Nitrous Oxide.—Nitrous oxide is a colorless gas with a characteristic odor. It is nonexplosive and nontoxic if oxygen is supplied in adequate concentration. Its use in hospital practice is definitely limited, and its application in the dental office has been fully described by Clement and others. For procedures of short duration, on tractable patients, nitrous oxide and oxygen anesthesia is excellent. Intelligent premedication is an aid in the use of this agent and it should be considered. For operations requiring more than ten or fifteen minutes, or for patients of the robust and athletic type, a more potent anesthetic agent is desirable if good anesthesia, adequate relaxation and normal oxygenation are to be maintained.

It should, however, be borne in mind that nitrous oxide-oxygen can be combined with regional or other anesthetics to afford proper operative conditions in many cases. In office practice, for example, nitrous oxide-oxygen analgesia, with local procaine hydrochloride anesthesia, is an ideal combination for the handling of apprehensive patients.

Ether.—This agent retains the foremost position in the choice of anesthetics because of its potency and wide margin of safety. The signs of anesthesia are most constant under ether, thereby providing a reliable guide for its administration. When ether is used alone, however, inductions are sometimes long, difficult and unpleasant, and the material is inflammable. The incidence of postoperative nausea and vomiting is high. It is still used for children with either the open or semiclosed cone. The plane of anesthesia is maintained in oral surgery with either oropharyngeal or nasopharyngeal insufflation or with the even more desirable endotracheal technic.

Real control can be attained with anesthesia induced endotracheally. Intubation, with proper packing or the use of an inflatable cuff, provides an airway that will be patent at all times and prevents the ingress of secretions from the pharynx to the trachea. A closed system can be maintained throughout the operation, and the operative field will be unencumbered by a facepiece. The surgeon may proceed without haste or concern for the patient's respiration. Intubation can be accomplished either directly or indirectly.

Direct Method.—Fairly deep anesthesia is required with this method for complete relaxation of the jaw and glottis. The larynx is exposed with a laryngoscope, and under direct vision a catheter with an inflatable cuff is inserted in the trachea to a point just below the vocal cords. The cuff is inflated, sealing the trachea. Anesthesia can be lightened, for the pain of oral surgical procedures requires only first plane anesthesia for its control. The tube is left in place until reflexes begin to return, tracheobronchial suction is performed and the tube is removed. Such technic is ideal for extra-oral procedures, but for intra-oral operations the tube may encroach on the surgeon's field.

Indirect Method.—This technic was developed by Magill of England where it is used extensively for all procedures. A

curved rubber catheter is inserted through the nose with the patient's head in the so-called sniffing position. Intubation can be accomplished during either a light plane of anesthesia, under which the tonus of the glottic muscles helps in directing the tube in the trachea, or under very deep anesthesia during which the extreme relaxation of the larynx provides a wider channel. The space around the tube is then packed carefully with moistened gauze strips. Gauze impregnated with petrolatum or paraffin may also be used to block the trachea at the point of its junction with the pharynx. The tube is connected to a gas machine, and the operative field is draped. The surgeon is unhampered by any equipment, and control of bleeding is possible at all times. This method is indicated when trismus of the jaw, ankylosis or fractures make it impossible to use the oral route. The only objection to endotracheal intubation is that its accomplishment requires a deeper plane of anesthesia than is necessary for the operation. The use of ether, obviously, should be confined to hospital practice.

Vinethene.—Vinyl ether was introduced in 1934 by Leake, who believed that it would combine the potency of ether with the rapid induction and low toxicity of ethylene. It is a clear colorless liquid with an ethereal odor. It is highly volatile, decomposes in the presence of light or acids and is in about the same range of explosiveness as ether. It is a 100 per cent potent anesthetic agent, providing rapid induction and achievement of the deeper planes of anesthesia in a short time. It is to be remembered that it is seven times as potent as ether, and, although it has a wide margin of safety, the rapidity of its action makes it more dangerous. Unconsciousness occurs in one half to one and a half minutes, and relaxation in two to three minutes.[6] Vinethene can be used with an open cone or in a gas machine. Inductions are smooth, rapid and devoid of struggle. Because of the potency of Vinethene, a high percentage of oxygen should always be present. Administration of Vinethene requires little equipment, and for short procedures it is an ideal agent. It should be remembered, however, that the signs which guide the anesthetist in using other anesthetics cannot be relied on when Vinethene is used.

Objectionable features of the use of Vinethene are the marked salivation it produces and the fact that damage to the liver has been observed after a prolonged period of anesthesia. To be on the safe side, Vinethene should not be used for a period longer than one-half hour, although its administration with the gas machine and with a high percentage of oxygen will make it safer. We use Vinethene, by open cone method, for the extraction of deciduous teeth.

Cyclopropane.—This is an isomer of propylene and is a gas of marked potency. In contrast to nitrous oxide, it allows for and requires a high percentage of oxygen. It is a 100 per cent potent agent in concentrations of 15 to 30 per cent.

In oral surgery, cyclopropane can be used only with a Leech airway or an endotracheal catheter. Its advantages are a quick pleasant induction and high oxygen content. It is the anesthetic agent of choice in shock and in diseases of the respiratory tract, because of its nonirritating effect. It must be administered by the closed method because of its explosibility and cost. Its administration requires considerable skill and experience because of the rapidity of its action. In the event of hypoxia or the presence of epinephrine in the blood stream, cardiac fibrillation may occur. Special precautions to prevent explosions are necessary when cyclopropane is employed. It is suitable for hospital use only.

Pentothal Sodium.—Of recent years, a mass of literature has accumulated on the subject of this agent. Its use in the war

6. Goodman, L., and Gilman, A., *Pharmacologic Basis of Therapeutics*. New York: Macmillan Company, 1943, pp. 72-75.

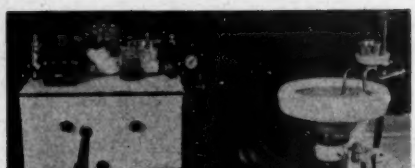

Fig. 1.—Arm board attached to chair

has shown that in proper, trained hands it is a safe, valuable anesthetic. In 5,000 administrations under the supervision of one of us (P.E.S.) in a general hospital, Pentothal sodium was used 75 per cent of the time in one combination or another. Thousands of cases with good results have been reported by oral surgeons[7-11] in office practice. Our own work only corroborates the belief that Pentothal sodium, intelligently used, is an excellent anesthetic for not only hospital use, but office use as well. The dentist employing Pentothal sodium should have special training and equipment for its use.

Pentothal is a thiobarbiturate of the ultra short-acting group and has a marked hypnotic effect with a somewhat limited analgesic potency. Originally it was injected in a 10 per cent concentration, but, because of its potency and the possibility of extravenous infiltration, a 2½ per cent solution is now used. Its action is rapid, and its elimination, whether by tissue or liver, is also rapid, so that by the intermittent injection technic it becomes a controllable anesthetic agent. For operations in the office, the potency of Pentothal allows for a very rapid and smooth induction, an advantage for both patient and surgeon. When used in combination with nitrous oxide and oxygen, Pentothal sodium makes possible smooth and prolonged anesthesia, and excellent oxygenation can be maintained. When used intelligently, Pentothal offers no greater dangers than do those agents more commonly employed for inhalation anesthesia, but definite attention must be given to certain factors for successful results. Control of secretions is of paramount importance, as well as the avoidance of laryngeal spasm by secretion or stimulation.

Premedication is essential. Atropine sulfate must be administered for the control of secretions and prevention of vagal reflexes. It is best used prophylactically, and we advocate that atropine grain 1/100 be given subcutaneously twenty minutes prior to operation. In emergencies it may be given intravenously at the time of induction of anesthesia, but for effective control of laryngospasm, atropine is best given before operation. Pentobarbital sodium grains 1½ may be given two hours prior to the operation so as to produce some basal narcosis, thereby cutting down on the amount of anesthetic necessary for induction and maintenance. Pentobarbital sodium is desirable, and we use it whenever possible, but it can be dispensed with. However, atropine must be given.

Attached to our chair is an arm board (Fig. 1) somewhat like that described by Stallcup,[7] Olson,[8,9] Hubbell[10] and others. A 20 cc. syringe, containing a 2½ per cent solution of Pentothal, is supported by a buret clamp projecting from the board. There is a two-way stopcock attached to the hub of the syringe, and a rubber tubing extends from this to a short glass pipet, to which is attached

7. Stallcup, L. B., Pentothal Sodium Anesthesia Using Automatic Control Syringe Method. *J. Oral Surg.* 4:1 (January) 1946.
8. Olson, Berto A., Administration of Pentothal Sodium in Specialized Office Practice in Oral Surgery. *J. Oral Surg.* 1:197 (July) 1943.
9. Olson, Berto A., Pentothal Sodium Anesthesia Indications and Contraindications. *J.A.D.A.* 32:67 (January) 1945.
10. Hubbell, A. O., and Adams, R. C., Intravenous Anesthesia for Dental Surgery with Sodium Ethyl (1-Methylbutyl) Thiobarbituric Acid. *J.A.D.A.* 27:1186 (August) 1940.
11. Bullard, O. K., and Brockett, S. I., Combined Pentothal Sodium-Nitrous Oxide-Oxygen Anesthesia in Oral Surgery. *J. Oral Surg.* 3:138 (April) 1945.

the needle for venipuncture (Fig. 2). The glass permits visualization of blood when the vein has been entered, the long rubber tubing allows freedom of motion for venipuncture and the syringe is undisturbed and out of the way of patient and operator. After venipuncture has been accomplished intermittent injection of Pentothal sodium is begun. Two cubic centimeters is injected as a test dose, and the patient's reflexes are observed. After the interval of a minute, if the initial dose is well tolerated, injection of fractional amounts is continued until the patient has lost consciousness.

Induction is rapid and free from violent episodes. When the patient has lost consciousness, the nasal inhaler of the gas machine is placed in position and a mixture of about 30 per cent oxygen and 70 per cent nitrous oxide is introduced under a moderate pressure of 3 to 5 mm. The advantages of the combination anesthesia, as Searles[12] and Adams[13] have pointed out, are manifold. There is an economy of anesthetic agents when the two are used in combination, thus providing for a shorter period of recovery. There is at all times excellent oxygenation, and thus adherence to normal physiology and provision for greater safety. When Pentothal and nitrous oxide are used together, a synergistic action is effected.[12] The analgesic properties of nitrous oxide enhance the hypnotic effect of Pentothal, to provide a light, smooth, safe and yet effective anesthesia.

On relaxation of the patient's jaw, induced by further injection of Pentothal, if necessary, a mouth prop is placed and a mouth pack is inserted in the proper position. It should be noted that the Pentothal setup is not removed when administration of nitrous oxide-oxygen is started. The two agents are used throughout the operative procedure. At this point, if local conditions do not contraindicate its use, procaine is infiltrated about the areas where extractions or surgical procedures are to be performed (Fig. 3, left). The value of the local anesthetic is twofold. First, sensory nerve fibers are blocked at their source, and the initial stimulation of the patient by surgical procedure is eliminated. Thus, a

12. Searles, Paul W., Intravenous Anesthesia. *J.A.M.A.* 118:117 (January 10) 1942.

13. Adams, R. C., Pentothal Sodium Intravenous Anesthesia in Peace and War. *J.A.M.A.* 126:5 (September 30) 1944.

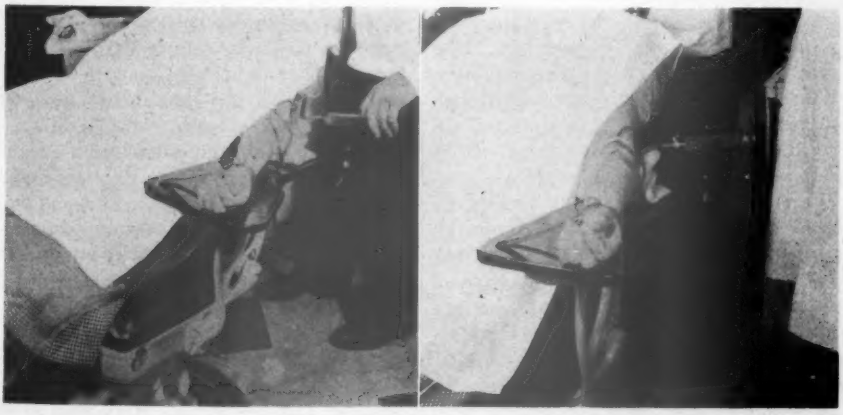

Fig. 2.—Left: Initial test dose of Pentothal sodium is being injected. Right: Appearance of syringe and needle apparatus at completion of operation

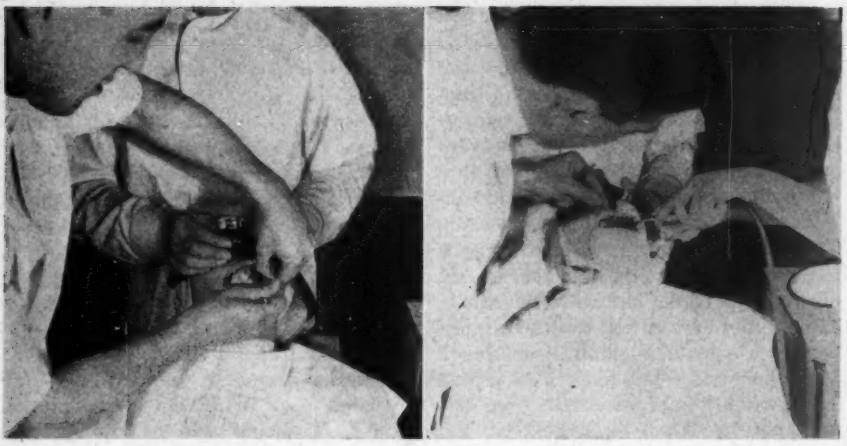

Fig. 3.—Left: Nasal inhaler and intravenous apparatus are in position. Mouth pack is visible. Procaine is being infiltrated. Right: Suction is being handled by assistant

light plane of anesthesia, always to be desired, can be used. The time required for postoperative recovery is reduced, and postoperative discomfort is minimized. Second, the use of procaine with incorporated epinephrine reduces bleeding, thereby effecting a fairly dry operative field with its attendant advantages for careful operation and maintenance of a patent airway.

The maintenance of an adequate airway is of primary importance whenever a general anesthetic is used. In some cases we use nasopharyngeal catheters, but, if a mouth pack is carefully placed, catheters can usually be eliminated. In conjunction with careful packing, which implies changing of packs whenever necessary, it is important that suction be used by the assistant during the entire operation (Fig. 3, right). If packs and suction are both judiciously used, it is gratifying to note the dryness of a patient's throat after a prolonged procedure.

Recovery from anesthesia takes somewhat longer when Pentothal is used than after nitrous oxide-oxygen given over an equal period of time. Our average operation performed with the patient under Pentothal in the office takes twenty or thirty minutes. Such patients must be given thirty to forty-five minutes for recovery in the retiring room before being allowed to leave the office. This appears to be consistent with the reports of Olson, Bullard and Brockett, and Stallcup. It is to be remembered that patients are awake to reflexes at the close of an operation, and if barbiturate premedication has not been given, time for recovery is hardly longer than that required after administration of nitrous oxide. We also feel that this method of combining anesthetics, with its utilization of minimal amounts of each agent, is a prime factor in reducing time required for the patient's recovery. In no case, using the combination of anesthetics, have we given more than ½ gm. of Pentothal sodium in 2½ per cent solution.

In hospital practice, Pentothal-gas-oxygen anesthesia is almost ideal for oral surgery. Premedication consists, as always, of atropine grain 1/100 given subcutaneously one hour prior to operation or intravenously several minutes before

induction. Morphine and pentobarbital sodium will enhance the effect of Pentothal and reduce the amount necessary for induction and maintenance. Morphine grain 1/6 is given in combination with the atropine, and the pentobarbital sodium grains 1½ is administered two hours prior to operation.

Position of the patient on the operating table is highly important. A 5 degree Trendelenburg position will provide a safe means for the dependent drainage of blood, thus avoiding the stimulation of pharyngeal reflexes. It is true that this position makes work on the lower jaw somewhat awkward; however, one can become accustomed to the position, and surgeons may find that it is convenient to approach the lower teeth from a position at the head of the table. The safety the position gives, with dependent drainage assured, compensates for the operative difficulties, which can be mastered.

For the maintenance of a patent airway, we use the double catheter technic, as suggested by Sidney Wiggin[14] in 1940. A nasal catheter, inserted in one naris, is connected to a gas machine which will provide an insufflation of nitrous oxide and oxygen so that a constant level of anesthesia is maintained. Through the other naris another large bore catheter is inserted. This catheter acts as both an airway and a suction tip for the removal of secretions as they occur. Both catheters are strapped to the patient's forehead and remain out of the operative field at all times.

The procedure is simple and can be set up in a short time. It is to be remembered that, despite the rapid action of Pentothal sodium, a period of five minutes from the time of its injection to the beginning of the operation, for equilibration of the drug, is advantageous for smooth maintenance of anesthesia. The ratio of 1 gm. per hour is seldom exceeded. Injection is made in 2 cc. doses until the patient loses consciousness, and maintenance requires injection of 1 to 2 cc. frequently during early stages and at longer intervals as the operation progresses.

Curare.—The latest drug to be introduced into anesthesia is curare. Although it is not an anesthetic agent, its antispasmodic effect is being employed widely today. Curare, or Intocostrin, is a highly purified preparation of the product which was employed in the arrow poison of the South American Indians. Although used in the laboratory for many years, it was first applied clinically to reduce the incidence of fracture in shock treatment for dementia praecox by Bennet.[15] Griffith and Johnson[16] and Cullen[17, 18] then used it to provide muscle relaxation in anesthesia. It is injected intravenously in fractional doses to provide muscle relaxation in one minute. The eyelids, jaw and glottis are first affected; the diaphragm is the last to be involved. The effects of the drug are eliminated in twenty minutes.

Curare can be used to facilitate intubation by providing early relaxation without inducing the depth of anesthesia ordinarily required. It can be used with agents of limited potency to provide muscle relaxation, but it must be remembered that it is a respiratory depressant and should not be administered unless means for artificial respiration with an endotracheal tube are at hand. Its antidote is neostigmine. Curare, Pentothal sodium and nitrous oxide-oxygen provide an anesthesia which produces adequate relaxation in a light plane, with the oxygen concentration always kept above

14. Personal communication.

15. Bennet, A. E., Preventing Traumatic Complications in Convulsive Shock Therapy by Curare. *J.A.M.A.* 114:322 (January 27) 1940.

16. Griffith, R., and Johnson, G. E., Use of Curare in General Anesthesia. *Anesthesiology* 3:418 (July) 1942.

17. Cullen, S. C., Use of Curare for the Improvement of Abdominal Muscle Relaxation During Inhalation Anesthesia. *Surgery* 14:261 (August) 1943.

18. Cullen, S. C., Clinical and Laboratory Observation on the Use of Curare During Inhalation Anesthesia. *Anesthesiology* 5:166 (March) 1944.

metabolic requirements. Each drug has a specific action, but together they approach very closely the ideal of a truly balanced anesthesia. They form a combination in which potent drugs are used in minimal doses so as to minimize toxic reactions and sequelae and yet produce the proper operative conditions.

Hemorrhage and trismus of the jaws after maxillofacial injuries make the use of a general anesthetic hazardous and difficult. Regional anesthesia, when possible, is ideal, but anatomic difficulties and duration of the operation may preclude its use. Intubation of these patients is a requisite for their management, because the trachea must be sealed against ingress of secretions, and the anesthetic equipment must not encroach on the surgeon's field. When intubation can be performed under topical anesthesia the problem is simplified, for anesthesia can be maintained with Pentothal sodium and nitrous oxide-oxygen without further difficulty. The level of anesthesia is light, and a quick recovery is possible.

When intubation under topical anesthesia is not possible, the procedure presents formidable obstacles. Intravenous drip equipment should be set up. In our practice the patient's throat is sprayed with a 10 per cent cocaine solution, and he is placed in a 5 degree Trendelenburg position. Through the intravenous tubing 2 cc. of a 2½ per cent solution of Pentothal sodium is injected, and the patient's reactions are noted. The dose given at initial injection is repeated at one minute intervals until the patient's consciousness is lost. A mixture containing equal volumes of nitrous oxide and oxygen is then administered. Trismus of the jaw may or may not be relieved. If not, curare will be of invaluable aid in relaxing the jaw so that suction can be performed and an airway established. Curare (Intocostrin-Squibb) is administered in fractional doses of 20 units until the desired effect is obtained. Once the pharynx has been cleared, anesthesia can be deepened and the dose of curare repeated for the intubation. The jaw will be relaxed and the glottis open or easily opened so that insertion of the tracheal tube with an inflatable cuff will be possible. Occasionally there is a reaction to the passage of the tube, but the instillation of a few cubic centimeters of a 2 per cent solution of cocaine will overcome it. Once the tube is in place and the cuff is inflated, the procedure is the same as that for any other operation on the head or neck. It has been found to be of advantage if the pharynx is packed so that the blood or secretion will not be trapped above the balloon. A 50 per cent mixture of nitrous oxide-oxygen is introduced into the tube through a semi-closed system. Intravenous drip is then instituted with a ½ to 1 per cent solution of Pentothal sodium. One of us (P.E.S.) recently handled a patient in this fashion with gratifying results. The case report follows:

A laborer, aged 44, suffered complete fracture of the frontal bone, fracture of the nose with bleeding and fracture of the maxilla as the result of a blow from the rim of an exploding tire. The patient's general condition was good. His blood pressure was 110/70, pulse was 80, and there were no signs of damage to the brain. There was trismus of the jaw which prevented a mouth opening of more than a half inch. Anesthesia proceeded as outlined above, with the exception that only ½ cc. of Intocostrin was necessary to relax the jaw to the point at which suction and an oral airway could be established. A total of ½ gm. of Pentothal and 50 units of curare was used for effecting the intubation. Anesthesia was maintained with a 0.1 per cent solution of Pentothal sodium by intravenous drip and nitrous oxide-oxygen in equal volumes. One gram of Pentothal, including the 2½ per cent solution used for initial injection and intravenous drip, maintained the anesthesia for two and a half hours. The patient's tracheobronchial tract was thoroughly aspirated and the catheter was carefully removed. Reflexes returned rapidly, and recovery was uneventful.

Conclusions

A variety of agents and technics is available for the production of anesthesia in oral surgery. Although all of them are satisfactory when administered by competent, experienced anesthetists, none is ideal. A knowledge of physiology and pharmacology is necessary for the safe administration of these potent drugs.

Nitrous oxide and ether still hold their leading places among anesthetic agents, but their use has been improved by premedication and the endotracheal method of administration. Vinethene and Pentothal sodium are becoming increasingly popular. Vinethene can well be utilized in office procedures but is contraindicated in the longer, complicated cases.

We have paid particular attention to Pentothal sodium because we feel that it approaches the ideal of anesthesia for oral surgery. The following points are to be stressed:

1. Pentothal sodium is recommended for procedures lasting longer than ten minutes.

2. Premedication with atropine is a must.

3. Fractional administration of a 2½ per cent solution of Pentothal is advocated.

4. Nitrous oxide and oxygen are combined with Pentothal sodium, and the two agents have a truly synergistic action.

5. Local infiltration is also advised whenever possible.

6. Careful attention to packing of the mouth and the use of continuous suction during the entire operation are stressed.

7. For hospital cases a double catheter technic is used, and the placing of the patient in a 5 degree Trendelenburg position is urged.

8. The addition of curare to the Pentothal-gas-oxygen combination provides a method for handling the more complicated maxillofacial cases in which maximum relaxation and intubation are essential during maintenance of a light plane of anesthesia.

Pentothal sodium, when handled intelligently, provides safe anesthesia with pleasant and rapid induction and smooth maintenance. Patients have little postoperative discomfort, and the recovery period is not much longer than that after equally long operations under nitrous oxide-oxygen anesthesia.

In the final analysis, it should be remembered that an anesthetic must be chosen for a particular patient and a particular surgical procedure. The choice of anesthetic should not be governed by the whim of a patient or operator but should be made on the basis of the studied opinions of the anesthetist and surgeon. Once the decision regarding the anesthetic agent has been made, the patient will receive the optimum benefit if surgeon, anesthetist and assistant work as a team to produce the greatest comfort and safety for the patient and the most efficient operation.—*114 Bay State Road.*

Emergency Dental Service in Industry.—A palliative emergency dental service giving relief to acute conditions among civilian employees at the New York Naval Shipyard during the war saved 5.3 hours of working time the first day alone, per disabling case returned to work. . . . In a similar dental service at the Hood Rubber Company, Watertown, Mass., where a working force of the magnitude of 5,000 is cared for, the plant dentist estimated that in the portion of his time devoted to palliative work (less than half) he saves more than enough man hours to cover his entire salary.—*James M. Dunning, "Public Health Aspects of Dental Service in Industry," Indust. Hyg. Newsletter 7:4, November 1947.*

PENTOTHAL SODIUM

FOR THE AMBULATORY PATIENT

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ANESTHESIA produced by the intravenous administration of Pentothal sodium (thiopental sodium) offers the ambulatory patient relief from the usual apprehension connected with his visit to the oral surgeon. It also offers many advantages to the surgeon. It allows complete control of the patient and a maximum of access to the field of operation, and the pleasant induction and recovery are helpful in overcoming the almost universal dislike of patients for this type of operation.

Pentothal sodium should never be administered without oxygen and equipment for endotracheal intubation at hand to safeguard against the possibility of respiratory obstruction.

When the drug is administered by the method to be described its use is uncomplicated for both patient and operator and allows the anesthetist complete use of both hands, obviating the necessity for another assistant.[1-3] Hubbel[4] said: "The anesthetist may be of great value to the dental surgeon if some means is provided to hold the syringe, thereby freeing the anesthetist to assist in the maintenance of the airway and administer emergency treatment when necessary."

The necessary equipment consists of a 250 cc. graduated tube, serving as a storage bottle, and a gum rubber tube about four feet in length to carry the anesthetic solution to the injection unit. The injection unit consists of two pieces of hematimeter tubing, a two way valve and a 6 cc. bulb (Fig. 1). This part of the equipment remains set up for numerous administrations of the anesthetic. Between administrations, only the needle and the tubing from the valve to the arm need be changed and sterilized. The line is filled by pressing the valve to open the tube to the needle and pressing the bulb. The valve is then released, opening the tube running toward the tank, and the bulb is released and is filled from the tank. In this manner the anesthetic solution is kept flowing in only one direction at the will of the operator.

Preparation of Solution

The stock solution is made by adding two 5.0 gm. ampules of Pentothal sodium to 500 cc. of sterile, fractionally distilled water which was autoclaved in the original bottle before the seal was broken. This makes a 2 per cent solution in a handy container and allows for storage with less handling and no contamination. The manufacturer recommends that bulk solution be kept for only twenty-four hours. However, Hubbell,[5] who reports over 40,000 administrations of Pentothal sodium, has used bulk solution as much as a week old with no noticeable adverse reaction from the patient.

1. Hubbell, A. O., and Adams, R. C., Intravenous Anesthesia for Dental Surgery with Sodium Ethyl (1-Methylbutyl) Thiobarbituric Acid. *J.A.D.A.* 27: 1186 (August) 1940.

2. Hubbell, A. O., Intravenous Anesthesia in the Dental Office with Sodium Ethyl (1-Methylbutyl) Thiobarbituric Acid. *J.A.D.A.* 28:1039 (July 1) 1941.

3. Hubbell, A. O., Intravenous Anesthesia in Dentistry. *Ann. Dent.* 3:3 (December) 1944.

4. Hubbell, A. O., Pentothal Sodium Anesthesia for Dental Surgery in Office Practice, and Control of Recovery Time. *Anesthesiology* 4:174 (March) 1943.

5. Hubbell, A. O., Personal communication.

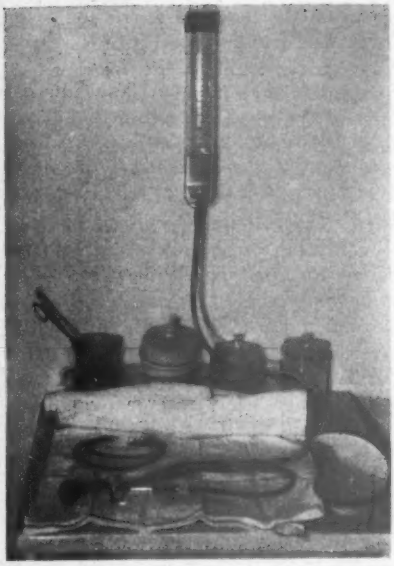

Fig. 1.—Storage tank which is marked with glass-marking pencil at start of each administration of anesthetic, and injection unit showing needle protector and tubes which are attached for each administration

Sterilization of Equipment

The entire apparatus can be cleaned at one time, before sterilization, if the storage tank is hung on a hook over the sink or hopper in the sterilization room. First, a solution of tincture of green soap in hot water is put in the storage tank. By pumping the bulb, the operator runs the solution through the system in the same manner employed when the injection is made. This procedure is followed by several rinses of alternately hot and cold tap water and a final rinse of distilled water. The parts of the system are then separated. The storage tank is sterilized in the autoclave, and the other parts are boiled in distilled water. This prolongs the life of the rubber. The tubing and bulb unit are wrapped in a sterile towel. The tubes of the injection unit, which are boiled loose, are then looped by inserting the observation tube into the female B.D. connector. The loops may then be handled and remain sterile.

The needles are cleaned with a hot solution of green soap and rinsed with alternately hot and cold water and are given a final rinse with distilled water. Before being autoclaved they are dried and covered with a glass tip connected to the needle by a rubber collar that just fits the hub. This collar can be made by cutting desired lengths of rubber tubing of the correct diameter. After sterilization, the needles are kept in covered containers and are removed with sterile forceps when needed.

Induction of Anesthesia

The patient's arm is prepared with alcohol and a germicidal soap solution consisting of high molecular alkyl[1]-dimethyl-benzyl-ammonium chlorides 0.5 per cent and inactive ingredients 99.5 per cent. The tourniquet (preferably a piece of hematimeter tubing which exerts ample pressure without discomfort) is applied, and venipuncture is made with the needle attached directly to the observation tube. The tube is then attached to the arm with Scotch tape, the tourniquet is removed and the injection is started (Fig. 2). A mouth prop is placed and 5 to 15 cc. of a 2 per cent solution of Pentothal sodium is injected.

Fig. 2.—Needle and observation tube are held in place by Scotch tape. Valve and bulb rest across patient's arm

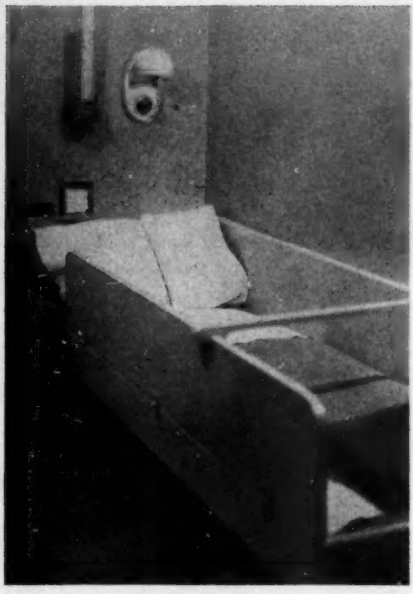

Fig. 3.—Bed in recovery room

The bulb will inject 6 cc. or any fraction of that amount at one time. The amount necessary for induction varies with the general vitality of the patient and can be determined only by the experience of the operator. Loss of eyelid reflex and lack of response to normally painful stimuli indicate sufficient depth of anesthesia. After induction there is a short period of apnea while the body adjusts to its decreased oxygen requirement, which is caused by the barbiturate. During induction the blood pressure falls slightly but soon rises again as anesthesia is produced.

Respiration is decreased in amplitude during anesthesia but is otherwise normal and offers the experienced anesthetist a positive guide to depth of anesthesia. Deep anesthesia and relaxation of the jaw are neither necessary nor desirable in oral operations, and the cough reflex need not be abolished because the throat is kept free of blood and mucus. Before operation the mouth and the site of incision are packed with gauze sponges. The sponges about the incision are changed as they become wet. This pack protects the airway from blood and foreign bodies. Coughing should be abolished by removal of the cause, such as blood or mucus which should be aspirated, rather than by increase in depth of anesthesia which prolongs the time required for recovery. If the operation is to be of prolonged duration, a drop or two of solution should be injected at intervals to keep the needle free of blood. After removal of the mouth pack, gauze sponges are placed over the operative site and the patient is asked to close his mouth in order to maintain the packs in position to prevent bleeding.

Recovery

The chair arm on the right side is lowered, and the patient is asked to slide over onto a chair with casters on it and is moved to a recovery room where he is placed on his side on the bed made up as in Figure 3. The sideboard is secured, and sponges are placed over the patient's wounds to prevent loss of blood. A corridor nurse is on duty at all times to change the sponges and aid the patients in recovery rooms. The patient may sleep a bit but in a few minutes will reawaken, usually with a smile, and make some remark about being surprised that the operation is over. A number of patients refuse to believe that the operation is completed until they have fully recovered. When the patient wakens, his position is changed. As soon as he is able to sit up he is given hot coffee or tea to reduce the euphoric "jag" caused by the drug.

The time required for recovery from Pentothal anesthesia is reduced if (1) anesthesia is light, which is all that is necessary for dental surgery; (2) short periods of anesthesia are employed, during which not too much operating is attempted at one time even by a skilled

surgeon and trained assistants, and (3) less concentrated solutions of the anesthetic drug are used. A 2 per cent solution will maintain light anesthesia, using less of the drug than a 5 per cent solution, and is less irritating to the vein. Recovery time is shorter in patients who have had a recent meal, but a full stomach offers possibilities for trouble and should be avoided. Supplementary anesthetics such as nitrous oxide and oxygen are used only for longer operations and will reduce recovery time because less barbiturate is needed. However, their use is impractical for short operations. Analeptic drugs have a questionable value as an aid in recovery, and we have discontinued their use. We have also discontinued the use of atropine sulfate as an antisialogogue as we have found it of no appreciable value.

Contraindications

Pentothal sodium is contraindicated if the patient shows any evidence of dyspnea attributable to any pathologic process within the respiratory system or any marked cardiac disease with or without decompensation.[6] However, many men skilled in the use of Pentothal do not consider that these conditions contraindicate use of the drug if it is administered carefully and supplemented with sufficient oxygen.[7]

It is not the anesthetic of choice if there is swelling in the throat or if deep infection of the neck is present, because obstruction of the airway increases the possibility of laryngeal spasm.

Pentothal is not a desirable anesthetic for the young. In patients less than 14 years of age it should be considered as contraindicated. Although they tolerate the anesthetic well they are usually extremely restless during recovery. We still feel that for those patients less than 14 years of age the combination of nitrous oxide and oxygen is the anesthetic of choice. Pentothal sodium may be used for any type of dental operation, provided the patient does not have one of the previously mentioned diseases whose presence contraindicates use of the anesthetic. We feel that it can be used readily for uncomplicated extractions as well as for more time consuming operations such as alveolectomy and removal of impacted teeth. It is especially indicated in the removal of lesions of the soft tissue and biopsy specimens, as there is no distortion of the tissue as when procaine hydrochloride is injected, and the rapid induction with a small amount of the barbiturate promotes rapid recovery. It is the ideal anesthetic for the alcoholic, the outdoor type and the highly nervous patient, all of whom present problems under nitrous oxide and oxygen. It is unfortunate that the average oral surgeon has seen so few inductions with Pentothal, as he becomes immediately cautious of the potency of the drug (which is wise) and it is not until he has seen several thousand cases in which this anesthetic is employed that he can determine in what instances it can best be used. The emotional status and age of the patient, rather than the type of operation, should be the criterion as to the choice of Pentothal as an anesthetic. Younger children who are in various phases of emotional development, the returned combat veteran and the hysterical patient should be considered poor subjects. This is not because of the risk involved in administration of the drug, but rather the more or less stimulated hysterical reaction of the patient during the recovery period. This can sometimes be avoided by supplementing the anesthesia with nitrous oxide and oxygen. The very elderly patient should be no great problem, and anesthesia for them may be supplemented with 100 per cent

6. Lundy, J. S., Intravenous Anesthesia; Preliminary Report of the Use of Two New Thiobarbiturates. *Proc. Staff Meet., Mayo Clinic* 10:536 (August 21) 1935.

7. Lundy, J. S., A Technical Description of the Intravenous Administration of Pentothal Sodium Based on Experience in More than 12,500 Administrations. *J. Canad. D. A.* 5:589 (November) 1939.

oxygen. However, with elderly sick patients it is well to consult the physician as to the anesthetic of choice. Pentothal is ideal for operations during pregnancy, as the patient does not struggle as with nitrous oxide and oxygen, and no restraint is necessary. For removal of hypertrophic tissue and for alveolectomies and apicoectomies in the maxilla Pentothal allows access to the area without interference from the nosepiece used with inhalation anesthetics. In extended operations it is wise to supplement Pentothal with nitrous oxide and oxygen in order to reduce the length of time required for recovery.

It is advisable not to administer Pentothal sodium to a patient who is going to operate a vehicle on leaving the office.

Conclusions

Pentothal should be administered by trained anesthetists only. The ease of its administration can often be considered as a disadvantage, since it frequently prompts those who are unskilled to attempt its use without considering the necessary adequate research and study relative to its administration. One must always consider that he is dealing with a drug which is a marked respiratory depressant. The dose of an intravenous anesthetic, once in the vein, cannot be reduced nor can it be eliminated with the ease with which an inhalation anesthetic can be eliminated. The anesthetist should be thoroughly trained and capable of combating efficiently and quickly any complications that might arise. In short, Pentothal is a highly potent drug and extremely dangerous in the hands of the unskilled.

The aid of a sufficient number of assistants is most desirable and the presence of a competent, trained staff assures greater safety by reducing operating time and thus minimizing the amount of anesthetic needed. In conclusion, we feel that the exodontist and oral surgeon, by including Pentothal sodium in their armamentarium, are in a better position to assure their patients pleasant and satisfactory service.—*516 Broad Street.*

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State Planning for Participation in the National Mental Health Act.—The concept of mental illness as a public health problem, while not new, has been rather slow in gaining general acceptance since people are inclined to think of mental disorders as phenomena peculiar to isolated individuals. However, the prevalence of mental illness, let alone its costliness, certainly qualifies it as a public health problem, necessitating public responsibility for its eradication and prevention.

The 600,000 patients in mental hospitals—occupying more than half of all the hospital beds in the country; the 125,000 new patients entering mental hospitals every year; the millions of everyday citizens suffering from psychosomatic or other neurotic symptoms which hamper them from leading fully useful and satisfying lives; the countless children showing behavior problems or turning delinquent as a result of emotional disturbances—all attest to the crying need for a public health program to improve the mental health of our people, and to the wisdom of the Congress in passing legislation which would make such a program possible.

The acceptance by the federal government of greatly increased responsibilities in the field of mental health is of tremendous significance. But it does not mean that the responsibility of the individual success of the program depends upon the type of teamwork which has proved so effective in other fields of public health—the cooperation and participation of the states, communities, and the public and private professional and lay organizations.

With such teamwork this nation can look forward with confidence to a successful conquest of one of mankind's worst afflictions—mental illness.—*"State Plans and the National Mental Health Act," Pub. Health Rep. 62:1183, August 15, 1947.*

ORAL USE OF ABSORBABLE OXIDIZED CELLULOSE IN THE PREVENTION AND TREATMENT OF POSTOPERATIVE HEMORRHAGE

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THE following report is the second of a series of three dealing with the clinical use of three materials in the control of hemorrhage associated with tooth extraction. In the first report a series of cases was described in which fibrin foam with thrombin was used.[1] A third report will deal with absorbable gelatin sponge used either with or without thrombin for the same purpose.

This investigation was undertaken to find a substance possessing hemostatic powers that can be placed in a tooth socket, either held in by sutures or packed in with sufficient pressure to hold without sutures, and that will not require removal. Many of the agents used by dentists to arrest hemorrhage are destructive to the tissues. Any material such as cotton or gauze that has been used to carry the hemostatic agent has required removal at a later date. Therefore a substance that can be left in place in the tissue and that either will dissolve or be absorbed without producing marked irritation or interfering with healing to any great extent definitely will have a place in dental surgical operations. Fibrin foam with thrombin fulfilled these requirements and has been used successfully in many types of surgical operations. Our series of cases proved to us that it was a valuable aid in controlling hemorrhage after tooth extractions.

Properties of Material

This report deals with the oral use of absorbable oxidized cellulose for the prevention and treatment of hemorrhage after the extraction of teeth. The material used in this series of cases was supplied to us for experimental purposes by Parke, Davis and Company under the name Oxycel. Yockel and Kenyon[2] in 1942 described a method of oxidizing cellulose by the action of nitrogen dioxide. By this action on ordinary gauze sponges or cotton pledgets the cellulose in the cotton or gauze is converted into a solid organic acid which maintains its original structure and has a tensile strength of about two thirds that of the original fabric. It has a pH of approximately 4.0. It is sterile as supplied and cannot be reautoclaved. It can be boiled for three minutes or kept in 70 per cent alcohol until used.[3] For dental purposes it is best to discard the tube when it has been contaminated and not to rely on the methods of sterilization at our command.

From the Division of Dental Surgery, University of California.

Read at the meeting of the California State Dental Association, San Francisco, April 29, 1947.

1. Gwinn, C. D.; Grimm, D. H., and Ferber, E. W., Oral Use of Fibrin Foam and Thrombin in the Prevention and Treatment of Postoperative Hemorrhage. *J.A.D.A.* 35:7 (July 1) 1947.

2. Yockel, E. C., and Kenyon, W. O., The Oxidation of Cellulose by Nitrogen Dioxide. *J. Am. Chem. Soc.* 64:121 (January) 1942.

3. Uihlein, Alfred, and others, Absorbable Oxidized Cellulose With Thrombin as a Hemostatic Agent in Surgical Procedures. *Surg., Gynec. & Obst.* 80:470 (May) 1945.

Because of its low pH, oxidized cellulose inactivates thrombin. If it is to be used with thrombin, it must be neutralized by being immersed in a 1 per cent solution of sodium bicarbonate before it is soaked in the thrombin solution. This process of neutralization weakens the strength of the cellulose so that more care must be taken in handling it. Although the first clinical work was done by Putnam[4] with the oxidized cellulose in combination with thrombin, others[3, 5, 6] have worked both with and without thrombin and have obtained good results each way. The oxidized cellulose has a hemostatic effect when applied to a bleeding surface or when packed into a bleeding wound. This effect is probably a result of the action which takes place owing to (1) the slightly acidic nature of the oxidized cellulose, as suggested by Light,[7] and (2) the swelling which occurs when the material is introduced into a wound dry, as the material becomes soaked with blood and so takes the place of the clot, as suggested by Frantz.[8]

As in the case of fibrin foam there is some tissue reaction after the use of the material but it is not marked. Frantz[5, 8, 9] tested the tissue reaction of oxidized cellulose in dogs, cats and rats. He and his co-workers found that the time required for disappearance of the cellulose when placed in the tissues depended somewhat on the amount of the material used and its location in the body. In open wounds the oxidized cellulose formed a brown gelatinous mass which could be scraped away from the wound surface without renewal of bleeding. In serous cavities in which a large single mass of material was surrounded by serous membrane, cysts sometimes were formed. According to Frantz, these eventually resorb. He found that in rats killed at intervals of from one to thirty days there was a progressive decrease in the size of the oxidized cellulose implants, and at the end of that period none of the material used could be demonstrated. In bone there was a definite delay in the formation of callus in clean experimental fractures. There was no significant delay in the healing when the oxidized cellulose was used in open lacerated compound fractures. This use would correspond to a certain extent to its utilization in tooth sockets.

Inasmuch as Frantz and others[3, 5, 6] have found oxidized cellulose to be effective in arresting hemorrhage without the addition of thrombin, it was decided that in our series of cases we also would omit the thrombin. The use of thrombin in the dental office complicates the procedure and adds to the expense of the operation. The thrombin must be dissolved in sterile physiologic saline solution, and a new bottle of thrombin must be opened for each patient. It was thought that, if the oxidized cellulose could be used satisfactorily without the thrombin, it might become a valuable means of arresting hemorrhage in the office of the general practitioner.

Oxidized cellulose as it is furnished under the trade name of Oxycel comes in a glass tube and is sterile. If the tube is opened under sterile conditions, a portion of the material can be cut off with sterile scissors for immediate use, and the remainder can be retained in the tube, covered with a sterile cover and kept for future use. Although this technic might not fulfill the requirements of the brain surgeon, we feel that it will be found satisfactory for oral use.

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4. Putnam, T. J., The Use of Thrombin on Soluble Cellulose in Neurosurgery: Clinical Application. *Ann. Surg.* 118:127 (July) 1943.

5. Frantz, V. K., and Lattes, R., Oxidized Cellulose—Absorbable Gauze (Cellulosic Acid). *J.A.M.A.* 129:798 (November 17) 1945.

6. Uihlein, Alfred; Clagett, O. T., and Osterberg, A. E. (discussion by A. E. Osterberg), The Use of Oxidized Cellulose for Hemostasis in Surgical Procedures: Preliminary Report. *Proc. Staff Meet., Mayo Clin.* 20:29 (January 24) 1945.

7. Light, R. V., Hemostasis in Neurosurgery. *J. Neurosurg.* 2:414 (September) 1945.

8. Frantz, V. K.; Clark, H. T., and Lattes, R., Hemostasis With Absorbable Gauze (Oxidized Cellulose). *Ann. Surg.* 120:181 (August) 1944.

9. Frantz, V. K., Absorbable Cotton, Paper and Gauze (Oxidized Cellulose). *Ann. Surg.* 118:116 (July) 1943.

Method

The cases reported are placed in three groups as in the previous series[1]: (1) those patients with a history of prolonged hemorrhage after extraction; (2) cases in which persistent bleeding from the wound occurred during the course of the operation, and (3) those patients having postoperative hemorrhage.

The technic of using the oxidized cellulose was the same as that used with fibrin foam and thrombin.

Group 1.—If the patient had a history of prolonged bleeding after extraction or if the medical history was such as to suggest prolonged bleeding, the oxidized cellulose was used as follows: The tooth was extracted and the socket smoothed as usual. Sulfathiazole powder was dusted around the margins of the socket. A portion of oxidized cellulose was shaped to fit the opening of the socket, dipped in sulfathiazole powder and placed over the blood in the socket. It was not forced down deeply into the socket. One or two plain catgut sutures, depending on the size of the opening, were placed buccolingually and tied across and over the oxidized cellulose to hold it in place. A sponge impregnated with petrolatum was placed over the socket, and the patient was instructed to exert gentle pressure for from two to three minutes.

Group 2.—If persistent bleeding occurred during the operation, the method used varied with the location of the bleeding point or points. If the bleeding originated from the cancellous bone, a small piece of oxidized cellulose was dipped in sulfathiazole powder and packed tightly in the cancellous bone at the bleeding point. If the vessel cut was located in harder bone and the opening was not large enough to allow the packing of the oxidized cellulose, the opening was enlarged either by forcing of the points of the cotton pliers into it or by the cutting away of a small amount of bone with a narrow chisel. The oxidized cellulose was dipped in sulfathiazole powder and packed into the opening. If the bleeding seemed to be coming from the vicinity of the inferior alveolar canal, oxidized cellulose dipped in sulfathiazole powder was placed against the bleeding point and held gently in place for one or two minutes by means of a moistened pledget of ordinary cotton. The cotton was removed, and the oxidized cellulose was left in place. Heavy pressure in packing the oxidized cellulose was not used in these instances for fear of damage to the inferior alveolar vessels.

If the bleeding occurred from the margins of the socket after the removal of the tooth, a larger pellet of oxidized cellulose dipped in sulfathiazole powder was placed in the orifice of the socket and sutured in place by means of one or two sutures placed buccolingually. Pressure then was applied over the socket for two to three minutes by means of a gauze sponge impregnated with petrolatum.

Group 3.—The postoperative hemorrhages were treated in two ways. The oxidized cellulose which had been dipped in sulfathiazole powder was placed in the socket opening and held in place, and gentle pressure was maintained over the socket with a gauze sponge impregnated with petrolatum for from five to ten minutes. If the bleeding continued and seemed to be coming from the deeper part of the socket, the region was anesthetized, and the oxidized cellulose was packed directly into the socket and sutured in place. Pressure was maintained for from five to ten minutes as before.

In the series reported in this article, the oxidized cellulose was used dry. As the material was packed into the bony wall of the socket or placed over the socket opening, it would become filled with blood and turn black. The clotting usually would occur immediately if the application was successful. The maintenance of pressure over the socket usually was done to allow time for the

clot to become firmer before being disturbed and not for the purpose of controlling the hemorrhage.

Results

Group 1.—In the group in which oxidized cellulose was used to prevent hemorrhage in patients having a history of prolonged bleeding, seventeen operations were performed on 10 patients. In five instances there was some bleeding after the patient left the office. In three instances there was so little bleeding that the patients did not return for treatment before their regular appointment.

One patient experienced bleeding after two operations. This woman returned, and the region was anesthetized, repacked with oxidized cellulose and sutured. She had had teeth extracted at four different sittings. She was suffering from polycythemia, and her hemoglobin was more than 160 per cent (26 gm. per 100 cc. of blood).

One of the other patients who reported some bleeding but who did not consider it sufficient to return for treatment had bled for four days after a tonsillectomy and had had trouble with hemorrhage for four days after a previous extraction.

In treating another patient who reported slight bleeding after extraction, we had extracted teeth and used oxidized cellulose three different times. The patient experienced postoperative bleeding after only one of the operations. He reported that after previous extractions the bleeding did not stop entirely for several days.

Included in this series is 1 case of chronic hepatitis with portal cirrhosis after infectious hepatitis. This patient, who complained of spontaneous bleeding from the gingival tissue at times, had no bleeding after the extractions.

One patient with severe anemia had had a splenectomy a year before, had had more than a hundred blood transfusions within the past two years and complained of bleeding gums. A lower bicuspid was extracted with no postoperative hemorrhage.

The remaining cases in this series were not unusual except that all of the patients previously had experienced prolonged bleeding after extractions or tonsillectomy.

Group 2.—Oxidized cellulose was used to stop excessive bleeding at the time of operation in 24 cases. In 6 of the cases there was bleeding from the bone or from the region of the inferior alveolar canal during the removal of impacted lower third molars. In 1 case there was profuse bleeding from the buccal bone between the upper first and second molars. If the bleeding came from the bone not in the region of the canal, the bleeding point was enlarged with the points of the cotton pliers and small bits of oxidized cellulose were packed in the opening. This procedure stopped the bleeding immediately. If during the operation this plug of oxidized cellulose was disturbed and bleeding recurred, the opening was repacked. If the bleeding seemed to be coming from the region of the inferior alveolar canal, a larger pledget of oxidized cellulose was dipped in sulfathiazole powder, pressed gently against the bleeding area or packed gently in the bleeding root socket and held in place with light pressure on a moistened sponge. The sponge was removed in from one to three minutes, and the oxidized cellulose was left in place. The socket then was treated routinely, and if a lubricated gauze dressing was to be used, it was placed in the usual way.

In 4 cases of impacted lower third molars there was persistent bleeding from the soft tissue in the distolingual portion of the socket. This bleeding occurred from the depth of the wound close to the second molar. Pledgets of oxidized cellulose dipped in sulfathiazole powder were pressed against the bleeding region and held in place for from one to three minutes. The oxidized cellulose was left in the wound. If no specific bleeding

point in a socket could be located, the oxidized cellulose was placed in the orifice of the socket and secured in place with buccolingual sutures. Pressure over the socket was applied for a few minutes by means of a gauze pack impregnated with petrolatum.

All of the patients treated in this group responded favorably, and bleeding stopped before they were dismissed.

Group 3.—Oxidized cellulose was used to stop postoperative hemorrhage in 16 cases, 9 cases of intermediary and 7 cases of secondary hemorrhage.

Two of the hemorrhages occurred in the same patient. This patient had polycythemia and has been spoken of before in Group 1. Extractions were performed at four different sittings. At two sittings lower teeth were extracted and at the other sittings upper teeth were extracted. Oxidized cellulose was placed in all sockets and sutured in place at the time of extraction. Postoperative hemorrhage occurred after extraction of the upper teeth but not after removal of the lower teeth. The postoperative hemorrhage was treated each time by anesthetization of the region, repacking of the sockets and thorough suturing. It is felt that the suturing in this case probably was more effective than the oxidized cellulose in controlling the hemorrhage.

In 2 of the cases of secondary hemorrhage, bleeding started three days after the extraction of impacted lower third molars, while the gauze dressings were being removed. In each of these the socket was packed with oxidized cellulose dipped in sulfathiazole powder, and bleeding stopped immediately. The oxidized cellulose was left in place, and no further gauze dressings were inserted. Healing was uneventful in each case. Bleeding was controlled promptly by single applications of oxidized cellulose in all of the patients with postoperative hemorrhage, with the exception of the patient suffering from polycythemia.

Comments

Oxidized cellulose (Oxycel) was used in the prevention and treatment of hemorrhage after the extraction of teeth in 57 cases. It was used without thrombin. It was found to be an effective agent for the control of hemorrhage after dental operations. Infection developed in none of the patients who were treated with oxidized cellulose, and there was no noticeable slowing up of the healing process.

There was no clinical evidence of a greater amount of pain or discomfort when oxidized cellulose was used than in comparable cases when it was not used.

The fibrous texture of oxidized cellulose enables the operator to pack it into small bone channels under pressure.

When proper precautions in the maintenance of sterility are taken, the contents of a tube may be used for several patients.

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Production of Rutin.—Rutin, first discovered in tobacco, is now being made commercially by at least 15 companies, according to Dept. of Agriculture. Dr. James F. Couch, Bureau of Agricultural and Industrial Chemistry, says one firm has built a factory for exclusive manufacture of the drug and another has erected a dehydrator to prepare buckwheat leaf meal for its rutin plant. Its value in treatment of capillary fragility demonstrated at U. of Penn. School of Medicine, rutin's best and cheapest source of supply is buckwheat and Dr. Couch believes that ultimately a 50,000-acre crop will be required to meet a demand for one million pounds annually. According to him, medical opinion is growing that uses of rutin are not limited to treatment of increased capillary fragility but that it should prove beneficial in many types of hemorrhagic diseases.—*Washington Report on the Medical Sciences, No. 23, November 10, 1947.*

FACTORS WHICH INFLUENCE CASTING ACCURACY: A UNIVERSAL CASTING TECHNIC

E. S. Smyd, D.D.S., Detroit

THEORETICALLY the expansion of the mold to compensate for the shrinkages of the materials employed in inlay casting should be no greater for gold jackets and occlusal inlays than for proximo-occlusal or thin three-quarter castings. The fact that almost every article on the subject of investing technics describes a modification of procedure for these castings raises a challenge for an explanation of the phenomena which give rise to the difference between theory and practice.

Mold Distortion

Wax patterns of the types mentioned require variation in investing procedure because of mold distortion.[1] The following factors alone or in combination produce such distortion:

1. The inexactitude of investing procedures may produce inaccurate expansion or distortion of the mold. It is disturbing to note, for instance, that certain standard investing practices do not even take into account the significant increment of expansion caused by hygroscopic growth. If a moistened asbestos liner is used in conjunction with the wax expansion technic, hygroscopic expansion undoubtedly takes place to a certain degree. For example, the temperature of a wax pattern formed in the mouth may decrease from 95 F. to 70 F., a drop of 25 degrees. The physical properties of a given wax may account for a dimensional shrinkage of 0.4 to 0.5 per cent or more within this range of temperature, but dentists may accept 0.5 per cent as a representative figure. Hollenback[2] has demonstrated that the class B golds exhibit a casting shrinkage of 1.4 per cent. This implies that the mold must be capable of yielding a compensatory expansion of 1.9 per cent, yet according to the reported specifications of the most highly expanding refractory, cristobalite, the setting expansion (0.36 per cent) and the thermal expansion (1.25 per cent maximum) combined yield at most 1.61 per cent. Experience has shown that adequate compensation of this pattern is possible with cristobalite investment. The additional compensation is probably a result of hygroscopic expansion.

2. Inlay waxes, like certain other plastic mediums, are likely to retain so-called elastic memory. Temperature changes incident to the investing of the pattern, the setting of the investment or the immersion of the invested case in a warm water bath serve to change or release pattern strains and thus produce pattern and mold distortions.

3. The resistance which the wax pattern offers to the expanding investment may produce distortion of the mold.

4. The expansion of the wax during dissipation by heat may exert a compressive force sufficient to distort molds of mesio-occlusal-distal, three-quarter and complete jacket types.

This article includes data obtained by experimental research, through which I

1. Smyd, E. S., Metal Inlays, in Gabel, A. B., *American Textbook of Operative Dentistry*. Philadelphia: Lea & Febiger, 1947, p. 380.

2. Hollenback, G. M., Shrinkage During Casting of Gold and Gold Alloys. *J.A.D.A.* 33:1391 (November 1) 1946.

intend to verify the second and third statements. The subject matter will be discussed with such annotations as to make it of special interest to the indirect worker who employs dies for cavity preparations.

Three Methods

The three methods of compensating for pattern and gold shrinkage which are described in dental literature are: (1) wax expansion, (2) controlled mold expansion and (3) hygroscopic mold expansion.

Wax Expansion.—This method has been described by a number of investigators, notably Van Horn[3-6] and Coy.[7-9] It employs thermal expansion of the wax pattern as an important part of the compensating means. Setting and thermal expansions of the mold augment the wax expansion.

Controlled Mold Expansion.—The introduction of cristobalite as a dental refractory by Weinstein and Coleman[10] has made possible a closely calibrated and controlled thermal expansion of the mold. In 1931 Paffenbarger and Sweeney[11] demonstrated the capacity of cristobalite for total compensation. Later Phillips[12] popularized a refinement of the method which purports to employ only setting and thermal expansions of the refractory for the entire compensation, although hygroscopic expansion is probably an unavoidable concomitant.

Hygroscopic Mold Expansion.—An original and brilliant development conceived by Scheu[13-15] cannot be isolated from setting and thermal expansions of the refractory, much less from the variation caused by the initial temperature of the pattern.

Each of these methods employs more than one variable factor to secure expansion. At best any specific method only selects and emphasizes one or another variable. Thus, as the wax expansion method generally is employed, undoubtedly a considerable part of the expansion is due to hygroscopic action. In fact, in later writings, Van Horn unwittingly described one of the hygroscopic methods of expansion in use today. The controlled mold expansion method employs a dampened asbestos liner as a cushion for expansion. As previously mentioned, the presence of moisture in contact with the investment during setting undoubtedly introduces hygroscopic expansion, but no consideration is given this factor in the technic. The hygroscopic mold expansion method makes use of a water bath maintained at 105 to 110 F. during the setting of the investment. If the pattern has been carved at room temperature, the placement of the invested case in a water bath of 110 F. greatly increases the pattern size and may cause serious distortion of the wax and mold for the reasons previously given. Setting expansion of the refractory and thermal expansion during the wax dissipation are necessary concomitants.

Of the three methods mentioned, the one emphasizing hygroscopic expansion seems to be most consistent in producing well compensated castings.

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4. Van Horn, C. S., Concerning Data, Materials, Conditions, Devices and Methods of Procedure Relative to Establishing Standardization in Dental Inlay Casting. *D. Cosmos* 74:474 (May) 1932.
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10. Weinstein, L. J., and Coleman, R. L., Physical Properties of Dental Materials. *J. D. Res.* 8:441 (June) 1928.
11. Paffenbarger, G. C., and Sweeney, W. T., Dental Casting Technic: Theory and Practice. *J. D. Res.* 11:681 (October) 1931.
12. Phillips, D. W., Controlled Casting. *J.A.D.A.* 22:439 (March) 1935.
13. Scheu, C. H., Precision Casting Utilizing the Hygroscopic Action of Plaster in Investment in Making Expanded Molds. *J.A.D.A.* 20:1205 (July) 1933.
14. Scheu, C. H., Controlled Hygroscopic Expansion of Investment to Compensate for Shrinkage in Inlay Casting. *J.A.D.A.* 22:452 (March) 1935.
15. Scheu, C. H., Practical Suggestions on Inlay Construction. *J.A.D.A.* 24:100 (January) 1937.

Pattern Distortions

In order that the variables operative in the investing technic may be controlled, it is well to study first the properties of the pattern because its behavior is responsible for perhaps most of the mold distortion. It is known, for instance, that wax is elastic and that it can be conformed into a pattern at a given temperature while retaining much internal stress. This internal stress sometimes is referred to as elastic memory and is the result of changing the form of the wax from one configuration to another by temperature and pressure, usually without melting the wax. If the wax is melted, the wax strains are dissipated. During chilling, however, if a temperature gradient is established between opposite surfaces of the wax, elastic memory is reestablished because the wax pulls away from the cooler side and shrinks toward the warmer. With a change in temperature and especially with an increase in temperature, the dimensional change in shape of the pattern is not uniform but is distorted in a manner to release the internal stress of the pattern. This has been demonstrated by Maves.[16] Consequently, in any investing technic which employs wax expansion as a form of compensation there is the possibility of distortion of the mold because of the distortion of the wax.

It is possible that in certain temperature ranges, for instance, at mouth temperature, supercooled resilient liquids, of which wax is an example, may exhibit the physical properties of metals when put to compression, tension and rolling. Inlay waxes are subjected to compression, tension and rolling during the carving process. The act of biting on the wax or of closing the articulator on it are examples of subjecting the wax to compression. Carving the wax to form is a combination of stretching and rolling it. These procedures undoubtedly are attended by stresses and strains in the wax pattern as they would be in metal.

16. Maves, T. W., Recent Experiments Demonstrating Wax Distortion of All Wax Patterns When Heat Is Applied. *J.A.D.A.* 19:606 (April) 1932.

Metal Dies

The metal dies employed in indirect inlay work are excellent conductors of thermal changes, but this quality if unrecognized may be a disadvantage. From the standpoint of retarding loss of heat through the die handle during making of the pattern, electroformed positives of inlay impressions which are supported on plaster or Hydrocal[17] handles are superior to those supported on metal handles. The friability of Hydrocal handles makes them less desirable for the rugged use to which inlay dies often must be put, consequently metal handles are recommended.

Loss of heat through the die handle is extremely significant in seasonal climates. The management of waxes in pattern making is much more difficult during the cooler seasons of the year than in summer. The difficulty of controlling wax shrinkage during the carving of patterns in a cool room is due to the fact that the handle of the die acts as a radiator. It conducts heat away from the warm wax and dissipates it into the cooler environment by radiation.

Inlay patterns should not be carved in a cold or cool room. Carving should not be attempted in a draft or when the air is disturbed by much walking to-and-fro or by other activity producing air currents, because air currents accelerate heat loss.

Elastic Memory

It is almost impossible to conform wax to a die unless the die is warmed. If marginal correction of a wax pattern is attempted by flowing molten wax from a wax carver to a cavity margin of a

17. Registered trade-mark of United States Gypsum Company, Chicago, for alpha gypsum.

cool die, the added wax shrinks and pulls away from the die. The reason for the curling of the wax under these conditions can be ascribed to the difference in temperature between the inner and outer surfaces of the wax pattern. If the die is at room temperature, the wax in contact with the die is also at room temperature while the outer surface to which the hot wax has been applied is at a greatly elevated temperature. As the molten wax begins to cool and congeal it shrinks, and in so doing it pulls the cooler wax which is in contact with the die in the direction of the center of shrinkage. If the added wax is forced into conformity with the die and held there while it chills, the pattern may hold its form at the given temperature, but the pattern is strained and is said to possess elastic memory. As soon as the rigidity of the wax is reduced by any increase in its temperature, as by the deliberate heating of the pattern in a warm water bath or by the temperature changes incident to investing the pattern and the subsequent setting of the investment, the strained margins will surely curl.

Elastic memory may be demonstrated vividly by the following experiment: Heat a stick of inlay wax in a water bath to about 110 F. At this temperature the wax is extremely elastic. Now bend the stick sharply into a 90 degree angle, and while it is held in the bent configuration, submerge it in a cold water bath. As long as the water bath remains cold the wax retains its deformation. Heat the water bath to 110 F., and the wax will uncurl part way to its original straight form.

Most of the significant strains produced in a wax pattern may be circumvented if the die is kept at an elevated temperature, 110 to 120 F. The die may be maintained at this temperature if the carving procedure is carried out in the cone of heat radiation from an infra-red lamp. However, there is some hazard to prolonged personal exposure to infra-red radiation. Wax carving may be carried out with greater safety and as effectively under the reflector of a tungsten illuminating bulb. A distance of 5 to 6 inches (43 to 46 cm.) from the reflector (when a hundred watt bulb is used) is a good average working radius. Pattern making over an electric heating pad is ideal. With the die at an elevated temperature, the wax flows readily from the wax carver to the die and remains in contact with the latter while congealing if slight finger pressure is maintained on it. In this instance the metal of the die picks up radiant heat and conducts it to the undersurface of the wax. The temperature gradient across the wax is slight since a temperature of 110 to 120 F. approaches closely the melting temperatures of many inlay waxes. Additions of wax to the pattern executed in the foregoing manner remain passively in contact with the die after the wax has congealed.

The aim in pattern forming should be to produce, as nearly as possible, strainless patterns. Then, contractions of the pattern incident to blowing investment against it and subsequent expansion of the pattern in the warm water bath to facilitate setting and hygroscopic expansion of the refractory may be achieved with the minimum of distortion.

Comment on Hygroscopic Method

Briefly described, the hygroscopic method of compensation here considered consists of placing the ring with the freshly invested pattern immediately in a water bath of approximately 110 F. After a half hour in the bath, the mold is prepared for casting by heating in an oven in which the temperature does not exceed 800 F. This method combines excellent compensation with a fine surface texture for most of the types of patterns occurring in the usual inlay operative procedures. As the method is nor-

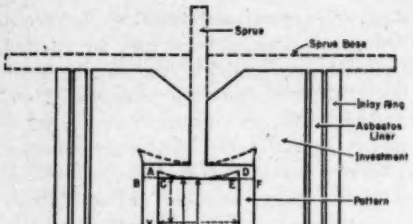


Fig. 1.—Diagram showing pattern distortion by expansion of mold during incipient gel phase

mally used, it fails to compensate completely when the castings are made for long straight preparations with parallel opposing walls, such as those exemplified by the familiar dies of the National Bureau of Standards. The jacket casting is the severest test of casting accuracy.

If a jacket type of pattern is mounted on the same sprue base as a proximo-occlusal type, and both are invested and cast in an investment of the cristobalite type with sufficient expansion to permit the jacket to go to place on the die, the proximo-occlusal inlay will be extremely loose on its die and the cervical edge of this casting will fail to contact the die. Dental castings should approach submicroscopic dimensional accuracy.

Mold distortion as a result of wax distortion already has been considered. The inaccuracy previously mentioned may result purely on a mechanical basis.

Mechanics of Mold Expansion

For the present analysis it can be assumed that the wax pattern is free of strains. Figure 1 represents a mesio-occlusal-distal pattern invested in a ring with an asbestos liner to permit unrestrained lateral expansion.

If the wax pattern has been formed at 110 to 120 F., the investing done at room temperature, and the freshly invested pattern immediately immersed in a water bath of 110 F., the pattern will return to its passive dimensions in a short time, and there is no thermal expansion of the pattern at the bath temperature.

Setting expansion is a rather significant fraction of the mold expansion. It may be 0.3 per cent or more. If setting expansion alone is considered, the expansion of the core of the investment should be exerting pressure between the proximal flanges of the wax pattern. In setting expansion and to a greater degree when setting occurs under hygroscopic influence, expansion begins while the investment is still plastic or in the incipient gel phase (Figs. 2, right, and 3, right).[18] Technicians have a right to assume that at least for this phase of the compensation for casting shrinkage, the compensation is ineffectual. What is worse is that this phase produces a distortion of the mold because the wax structure (pattern) probably is reacting in a characteristic manner to resist expansion of the mold.

The distortion probably takes place in the following way: In Figure 1, a small area of the investment is pushing against the wax structure at X. The wax structure is resisting this shove by the strength of the occlusal section of the pattern plus the strength in shear of the section at A and D. Since the thicknesses of the sections at A and D in actual cases are much greater than the depth of the occlusal section and since castings never exhibit evidence of shear across the line BC and EF, the possibility of shear occurring across BC and EF may be disregarded. However, since the occlusal section may be relatively thin, there is a possibility for a deflection of

18. Skinner, E. W., *The Science of Dental Materials*, Philadelphia: W. B. Saunders Company, 1944, p. 31.

the wax structure by the expansion of the core. Thus, assuming that all dimensions of Figure 1 are uniform, one may consider with interest the effect of a unit force applied at X, Y and Z. At X the unit force is exerted through the lever arm 1. The wax structure resisting the unit force or shove at Y is at a mechanical disadvantage by the length 2; and picturing the situation at Z, the wax structure is at the mechanical disadvantage of 3.

As far as I know, neither the magnitudes nor the characteristics of the setting and hygroscopic forces have been determined. In so far as the magnitudes are concerned, they are probably very great. Changes of physical state often give rise to tremendous force, for example, the freezing of water. The quantitative study of these qualities would be an interesting and extremely profitable research project.

Experimental Data

Once the refractory sets, the force of the combined setting and hygroscopic expansion is remarkable and, undoubtedly, it is capable of stretching the pattern uniformly in all three dimensions. I have demonstrated this to my satisfaction rather simply by cutting through the length of one side of an inlay ring. By filling the inlay ring with hygroscopic investment and immersing the ring in water, I could observe the degree of expansion which took place. The experiment was intended to be purely qualitative, but by making the cut sharply defined, a fair degree of measurement could be realized. By testing the state of the setting investment with a sharp instrument in the manner of a Vicat needle while the ring was immersed, I could hold the ring shut during the early phase of the setting expansion; but when the investment had hardened, I could not hold the two edges of the ring together (Figs. 2, 3 and 4). It is interesting to note that a loose cushion of asbestos liner does not inhibit the radial expansion of the investment during combined setting and hygroscopic expansion because the core does not crack (Fig. 5).

The crack in the investment denotes two things; that is, the relative amount of the expansion, and that if the expansion is restrained, the mold will be deformed or distorted. In view of the latter, if a mesio-occluso-distal pattern offers resistance to expansion, it will be deformed or spread open in the same manner as the ring shown in Figure 4, left.

To verify and carry out the analogy somewhat more forcefully, I invested the

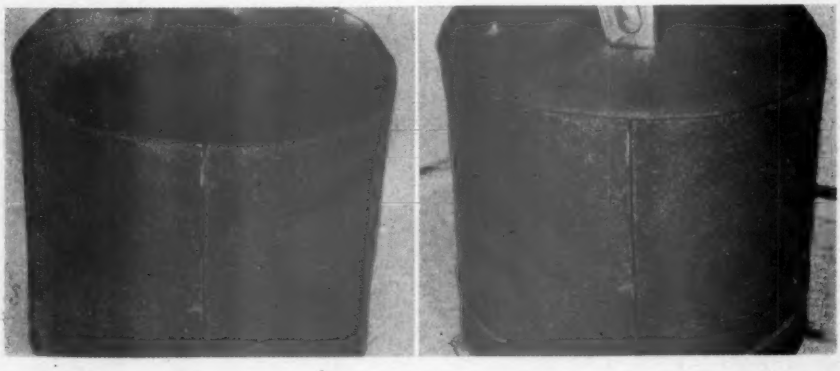


Fig. 2.—Left: Closeup of split ring. Right: Mold expansion in incipient gel phase during ordinary or air setting

Fig. 3.—Left: Mold expansion of completely air-set investment. Right: Mold expansion in incipient gel phase with investment setting under water at 110 F. The scalpel was used to denote the state of set of the investment. The image of the scalpel thrown across the length of the ring is its reflection on the surface of the water

split ring (now the mesio-occluso-distal pattern) with one mix of investment in a ring loosely lined with asbestos ribbon (Fig. 6). The characteristic spreading of the inner ring can be observed (Fig. 7).

Then I invested the inner ring in an outer ring without the use of an inner liner of asbestos (Fig. 8, left) and was amazed to discover, first, that a slight expansion of the inner mold occurred despite the absence of the asbestos liner (Fig. 8, right) and, second, that the refractory was resilient (Fig. 9). Under the restraint of the outer ring, the investment core of the inner ring expanded mostly endwise. The bulge of expanded investment is shown in Figure 8, right. However, after having repeated the experiment many times, I believe that some lateral expansion of the inner core also takes place. Can this mean that the force of combined setting and hygroscopic expansion has the prodigious force to expand the outer ring to a visible degree? When the inner ring is cut out of the outer ring, the resilience of the investment of the inner ring spreads the inner

Fig. 4.—Left: Mold expansion resulting from combined setting and hygroscopic expansions. The rubber band assured complete closure of the ring. Right: Photograph of mold

ring to a definite degree (Fig. 9). One wonders what the effect of the resilience of the investment must be, when it does occur, during the dissipation of the wax for casting. Incidentally, if the asbestos liner does not coat the inner surface of the outer ring from edge to edge; that is, if a considerable ring of investment contacts both the inner and outer rings, the expansion of the inner ring is always greatly reduced. The reduction in the expansion of the inner ring is almost as great as that occurring when no liner is used.

Reverting to the previous analysis, if it is assumed that the force per unit area exerted at X is insufficient to deflect the pattern at this level, it is altogether possible that the same force at Y or possibly at Z may succeed in deflecting the wax (Fig. 1). It is common knowledge in engineering that the stiffness of a beam undergoing bending varies inversely as the cube of its depth and directly as the cube of its length. A unitary force at Y would have eight times the bending effect on the occlusal section that it would have at X.

$$2 \times 2 \times 2 = \text{length}^3 \text{ at Y}$$

And at Z the unitary force would have twenty-seven times the bending influence on the occlusal section that it would have at X.

$$3 \times 3 \times 3 = \text{length}^3 \text{ at Z}$$

The expansion of the mold should be uniform radially. If the expansive force of the core is too weak to push the molecules of wax past each other as in a stretching and shearing action, the net result of the expansion of the core will be a distortion in which the subsequent casting will be expanded relatively more at the cervical region than at the occlusal. This accounts for the mesiodistal rocking of two surface and three surface inlays on their dies. The wax patterns of such castings could not be similarly rocked.

Again, since the stiffness of a structure in deflection is a function of a cubed power of its depth, wax patterns which

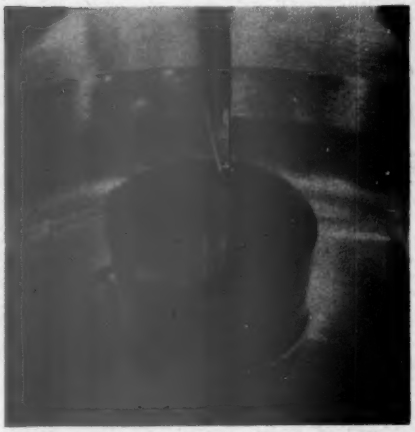


Fig. 5.—Completely set investment. The combined setting and hygroscopic expansions do not distort the mold if radial expansion is made possible by a cushion of asbestos sheeting

are thick will resist expansion of the core much more effectively than thin patterns. This is the reason why patterns of thin three-quarter crowns seem to require much less expansion than bulky patterns. The point is that a pattern of uniform thickness and any given length is eight times stiffer at 2 mm. thickness than at 1 mm. thickness.

Three-Quarter Crowns.—In the case of a

Fig. 6.—Split inner ring invested in outer ring. The investment is separated from the outer ring by a loose coil of asbestos sheeting

Fig. 7.—Left: Crack in the investment of the inner ring demonstrates that considerable lateral expansion took place under the conditions of the experiment. The investment is completely set at this time. Right: Investment has been extruded from the flask, and the outer investment has been partially cut away to show the magnitude of the lateral expansion

three-quarter crown, the two proximal surfaces are united by a web (to use an engineering term) of wax which covers the lingual or possibly the buccal surface of the tooth. Since this web greatly stiffens the proximal surfaces, they are much less likely to be buckled out in the cervical region. Those who wax up many indirect inlays know that when difficulties with three-quarter crowns arise, some thin margin, usually the occlusal, will be deflected and fail to make precise contact. If several castings are made in these troublesome cases, the same discrepancy reappears in the same position with surprising regularity. This discrepancy is caused by the expanding, and still plastic, inner core of investment.

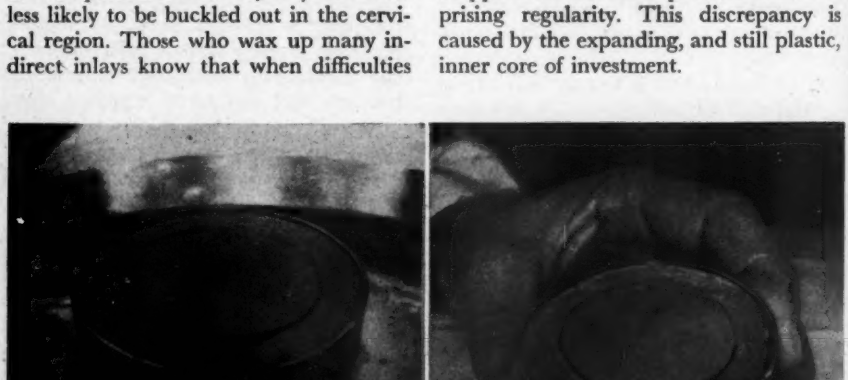


Fig. 8.—Left: Split inner ring is invested in a flask without an asbestos liner. Right: Inner ring shows slight lateral expansion despite absence of asbestos liner

The difficulty previously mentioned need not be experienced if soft wax instead of inlay wax is used to form the pattern. The soft wax pattern retains less strain and, being formed of a less resilient material, it offers less resistance to the expanding investment during its plastic phase. This matter will be amplified in the remainder of this article.

In order to verify my theory, I set up the following experiment: A stick of inlay wax was placed in a water bath, and the temperature of the bath was raised gradually until the wax began to take on a sheen as in the incipient stages of melting. This temperature was found to be about 150 F. I reasoned that the more nearly the melting temperature of the wax was approached the less was the residual stiffness of the wax. Patterns were made of a thick, fairly straight-walled jacket preparation resembling the Bureau of Standards' die and of a thin two surface inlay preparation (Fig. 10), and always the crown and the proximo-occlusal inlay were invested together on the same sprue base. The patterns were invested in a ring containing a loosely coiled asbestos liner, and an investment intended for the hygroscopic expansion technic was used. The ratio of proportions of water to powder was followed closely. Immediately on filling the ring, I placed the invested case into a water bath kept at 140 F. by a pilot gas flame. The invested cases were kept in the bath for a half hour. The wax was eliminated at 600 to 800 F., and castings were made on a centrifugal casting machine.

Whereas the crown could not be made to go to place on the die when the castings were made from an investment held at 110 F., when made from an investment held at 140 F., both the crown and the two surface inlay were well compensated, although both were overexpanded to a slight degree (Fig. 11, left). Interesting was the fact that the two surface inlay was not loose.

Thermal Expansion.—I am well aware that the thermal expansion of the patterns contributed to the compensation. The patterns were formed at about 110 F. An inlay wax was used whose thermal expansion curve flattened out at about 117 F. (Fig. 12).

Fig. 9.—Inner ring shows greater expansion when cut loose from the restraint of the outer investment

Since the wax expands about 0.04 per cent per degree Fahrenheit in the temperature range of 110 to 117, when the invested case reached a temperature of 117 F., the mold was enlarged approximately 0.3 per cent by the thermal expansion of the patterns. It will be shown later that this thermal expansion of the wax was not the significant factor in securing adequate compensation; in fact it may have been the factor which intro-

Fig. 10.—Dies of the crown and thin proximo-occlusal patterns

Fig. 11.—Left: Castings made from mold hygroscopically expanded in bath maintained at 140 F. Right: Castings made from mold hygroscopically expanded in bath maintained at 150 F.

duced the slight degree of undesirable overexpansion.

By actual test the temperature of solidification of the molten inlay wax was found to be about 155 F., so the experiment was repeated using a water bath heated to this temperature. The resulting castings were poorly compensated (Fig. 11, right). Examination of the castings seemed to indicate that an attenuation of the wax pattern took place during the heating in the bath. A sprue base was used in the experiments which employed a wax receptable into which multiple sprues could be embedded for a given investing procedure. The attenuation of the patterns was such as to suggest that the plastic wax of the base softened to such a degree as to furnish little support to the sprues embedded in it, and the gravitational pull of the sprue on the wax pattern (to which it was still attached because of the higher melting temperature of the inlay wax) was sufficient to distort its form.

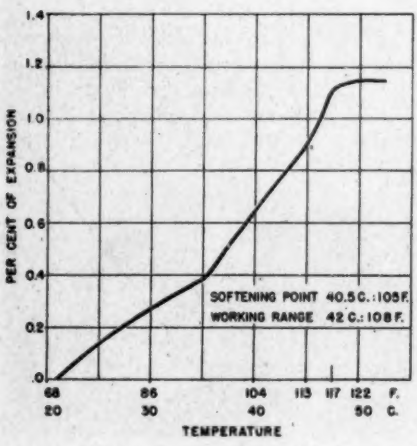


Fig. 12.—Thermal expansion curve for inlay wax used in experiment

Patterns then were invested in a water bath maintained at a temperature of about 124 F., which was slightly more than the temperature at which the thermal expansion curve of the inlay wax flattened out. Castings made under these conditions were even better compensated than those made at 140 F. (Fig. 13, left). It would seem that the elevation of the bath temperature to that approaching the melting range of the wax is unneces-

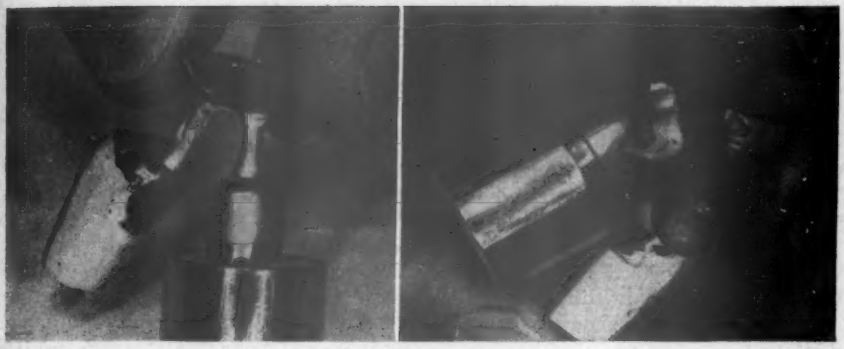


Fig. 13.—Left: Castings obtained from molds hygroscopically expanded in bath maintained at 124 F. Right: Crown pattern made of casting wax is insufficiently expanded under the conditions of the experiment

sary as long as the elastic range of the wax is superseded.

Finally the conditions of the experiment were altered to the extent that a wax plastic at a temperature of about 105 to 110 F. was used to form the pattern, and the temperature of the water bath was maintained at 110 F. I reasoned that if the stiffness of the wax was responsible for distortions of the mold which in turn made necessary the greater compensatory expansions postulated for crowns and occlusal inlays, a wax plastic at the ordinary working temperatures of the technic should produce undistorted molds for crowns as well as for two surface inlays, simultaneously. This was substantiated by the experiment.

The experiment consisted of forming two patterns of the jacket die and of the proximo-occlusal die. One pair of patterns was made of an inlay wax accepted by the Bureau of Standards; the other pair was made of a rather soft plastic

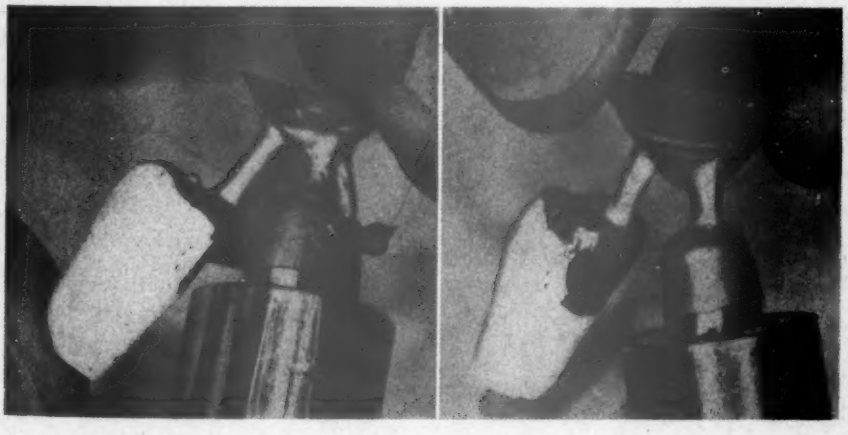


Fig. 14.—Left: Crown and proximo-occlusal inlay patterns made of plastic wax produce accurately compensated castings under the conditions of the experiment. Right: Castings made from plastic wax patterns and hygroscopically expanded molds.

casting wax. The new die lubricants (microfilm) make possible the forming of very fragile wax patterns. All four patterns were mounted on the same sprue base, and the usual investing and casting procedures were carried out. The photograph reveals that the stiffness of the inlay wax prevented the necessary compensatory expansion for accurate castings (Fig. 13, right), whereas the softness of the plastic wax yielded castings of accuracy for both the proximo-occlusal as well as the jacket preparation (Fig. 14, left).

Figure 14, right, exhibits more clearly the accuracy of compensation afforded by the plastic wax on the same two dies.

Summary

The reasons why patterns of proximo-occlusal and simple occlusal or jacket preparations require modification in laboratory procedure to obtain proper compensation for casting shrinkage were considered. In so far as the various factors involved in producing distortion of the mold may be controlled, the differing types of inlay patterns require no modification in laboratory procedure.—*7815 Jefferson Avenue East.*

THEORY OF ADHESION AND IMPRESSION TECHNIC FOR FULL DENTURES

John Patella, D.D.S., Brooklyn

A CONCEPT of denture retention popularly referred to as "mucostatics" has occasioned considerable discussion in recent years. This term was introduced by Page[1] and is a convenient expression for denoting the application of a physical force to the retention of full dentures.

The attraction between moistened glass slabs lying face to face and the resistance to any attempt to pull them apart is well recognized. The degree of attraction increases as the thickness of the film of moisture decreases. Mucostatics is nothing more than the application of this physical principle to full denture retention. It is obvious then that if this principle is to be applied, the denture base and the underlying supporting structure must have complementary surfaces; that is, a perfect contact relationship must exist. Hence, the problem is to avoid tissue displacement during the impression process, the tissues remaining passive throughout.

In referring to the attractive force binding complementary surfaces which are separated by a film of moisture, Page[1] used the term "interfacial surface tension." Since I have been unable to find this term elsewhere in the literature, I assume that it was coined by Page himself.

A search of the literature reveals that certain investigators were able through painstaking experiments to establish the nature of this phenomenon of attraction, otherwise known as adhesion. In a series of experiments with glass beads, Stone,[2]

Formerly Major (DC) AUS, Kelly Field, Texas.

1. Page, H. L., Mucostatics. *Contacts* 4 (August-October) 1943.

2. Stone, William, Some Phenomena of the Contact of Solids. *Phil. Mag. & J. Sc.* 9:610 (April) 1930.

in 1930, was able to establish that adhesion between solids in contact was dependent on an intervening moisture film. In 1911, Budgett,[3] using precision steel blocks, tested the adhesive properties of a number of liquids and was able to analyze the nature of the attractive force. His numerous experiments led him to the conclusions that (1) 75 per cent of the adhesion is caused by the presence of a liquid film between the faces in contact, (2) not more than 25 per cent is due to atmospheric pressure, (3) adhesion practically vanishes when no film is present and (4) intermolecular attraction between the solids is negligible.

Budgett's further analysis of the first point revealed that (1) breakage occurs in the liquid itself and not between the liquid and the steel, (2) only 4 per cent of the force required to rupture the film is due to surface tension, (3) the remaining 96 per cent must be necessary to overcome the molecular cohesion of the liquid and (4) the tensile strength of water may, under certain conditions, amount to nearly sixty atmospheres.

In view of these investigations, it would appear that the term "interfacial surface tension" is not only inapplicable but also misleading.

Budgett also found that no adhesion could be obtained with volatile liquids such as alcohol, benzine and petrol and that various liquids such as glycerin and glucose produce little effect.

Technic

The initial steps of the technic deal with the preparation of modeling compound impressions that have been muscle trimmed. All that need be said for this phase is that the compound should be well softened so as to minimize displacement of soft tissue through pressure. After the impressions are removed from the metal trays, they are cut down to proper thickness and muscle trimmed (both functionally and by manipulation) absolutely free of muscle action. It will be found convenient to use carborundum disks in the handpiece for the removal of gross excess of compound from the primary impressions before and after separation from their trays.

Upper Impression

The muscle trimmed impression, which now serves as a tray, is reduced free of tissue contact by removing compound of about 1 mm. thickness from the entire tissue-bearing or inner surface. This is quickly accomplished by the use of a sharp thin blade and both large and small vulcanite scrapers.

In cases in which undercuts exist in the buccal and labial regions, additional removal of compound is necessary in order that these may not impede insertion of the tray and flow of the impression material. If the anterior ridge has a labial inclination, the insertion of the tray must follow a diagonal (vertical posterior) direction with consequent trapping of impression material in the region of the labial crest. In such cases an additional outlet for the escape of excess impression material must be provided, and this is done by drilling several perforations in the labial flange near the crest area by use of any large fissure bur.

Finally, a paper clip is fashioned into a U with its ends bent away at right angles. This is embedded, after heating, in the outer surface of the tray in the molar region and provides a means for removing the tray from the mouth and for holding it when pouring the cast. The time required for the preparation of the upper tray from the primary impression is fifteen to twenty minutes.

For the final impression, alginate impression material is used. Each sealed tube contains sufficient powder for four impressions. The powder is stored in a wide mouthed bottle, and the proportions used are 20 cc. of uncondensed powder

3. Budgett, B. A., The Adherence of Flat Surfaces. *Proc. Roy Soc., London* 86:25 (December) 1911-1912.

to approximately 13 to 14 cc. of water. In areas in which the calcium content of the water is high, it might be well to use distilled water. Since the setting reaction occurs between calcium ions and the alginate salt, an increase of calcium would accelerate the reaction.

For the upper impression the mixture should be slightly thinner than for the lower, and in both cases it should be of a thinner consistency than that used for partial impressions. Also, for the upper impression, the amount used should be slightly in excess of that required for the impression but not enough to overload the tray.

The tray is now inserted in the mouth and gently eased to position. The mouth, which first should be rinsed free of mucus, should be opened only far enough to provide sufficient working space. The point of final seating can be learned after several trials. Pressure must never be used, and the related musculature is allowed to remain passive throughout this procedure. The alginate adapts itself easily to the muscle trimmed outline of the tray. After the impression has set (two to three minutes), the tray is removed by means of the contoured paper clip and is examined under tap water. If it is unsatisfactory because of evidence of pressure points, the alginate, which peels off readily in one piece, is removed, and this final step is repeated. The completed impression, after thorough washing under cold tap water, is immersed in the fixing bath for five to ten minutes and then is poured without boxing. After initial setting of the stone, the cast is immersed in water until ready for separation.

It will be noted that nothing has been done to establish the posterior termination of the palatal region; however, this need only be approximated. Since the stone cast is not altered (no postdamming or palatal relief) but remains throughout an exact duplicate of its counterpart in the mouth, the posterior termination of the palatal region can be established either before curing or on insertion of the denture. The finished dentures likewise are exact negatives of their corresponding ridges. I do not hesitate to reduce the palatal extension well forward of the junction of the hard and soft palate when patients are unusually sensitive in that region.

Lower Impression

The technic for taking the lower impression differs in some respects from

Fig. 1.—Left: Muscle trimmed modeling compound tray with baseplate wax bridging lingual space. Right: Resulting cast with baseplate wax covering denture-bearing surface

that of the upper impression because the muscle trimmed lower tray has a fragile structure and seldom lends itself to the method of reduction of the inner surface, as previously described.

A cast is poured by use of the muscle trimmed lower tray after bridging the lingual space with baseplate wax. The wax border should be flush with the entire lingual periphery and extend back to the distal termination of the tray, the purpose being to establish a freely accessible lingual surface (Fig. 1, left).

After the cast is dry, a full thickness of baseplate wax is adapted over the denture-bearing surface, care being taken to preserve its original thickness at all points. The wax is then sealed to the cast around its periphery. Any undercut areas are eliminated or reduced by the addition of wax, and the outer wax surface is lubricated (Fig. 1, right).

Next, a metal tray of suitable size is selected, and a modeling compound impression is taken of the prepared cast. The compound should be heated just enough to make it plastic. The impression is chilled, removed from the cast, separated from the tray and cut down to proper size. The resulting modeling compound tray is now free from tissue contact. Unlike the upper tray, however, its inner surface is smooth so that anchorage must be provided for the alginate. This is done by perforating the tray in each retromolar pad area, in the lingual frenum area and in the linguo-molar area close to the periphery. Finally, a contoured paper clip is fixed to the outer surface in the bicuspid-molar region, thus completing the preparation of the lower tray (Fig. 2).

Here, as in the case of the upper tray, the alginate-bearing tray should be eased to place with the mouth open short of strain and all related musculature at rest. It will help in centering the tray if the anterior portion first is partially seated. Any overextension that may result on the lingual side can be reduced with a sharp thin blade. The impression is poured without boxing, and the lingual space is preserved by manual contouring of the stone mix in this area (Fig. 3).

Discussion

The accuracy of impressions resulting from this technic is evidenced at the time of bite registration when well adapted trial baseplates exhibit positive retention. It will also be noted that the finished artificial denture acquires retention the moment contact is established with the underlying tissue and that no pressure is required. When tissues are displaced by pressure when an impression is taken, a similar degree of displacement must be effected by the resulting denture in order to gain retention. Such a condition, however tolerable to the patient, is potentially harmful and must eventually result in resorption of the underlying bone with consequent discomfort and loss of retention.

It is claimed that only a cast metal base of the newer alloys is capable of accurate reproduction of the impression. Although acrylic resin cannot be said to possess this ability to an absolute degree,

Fig. 2.—Completed lower tray ready for final impression

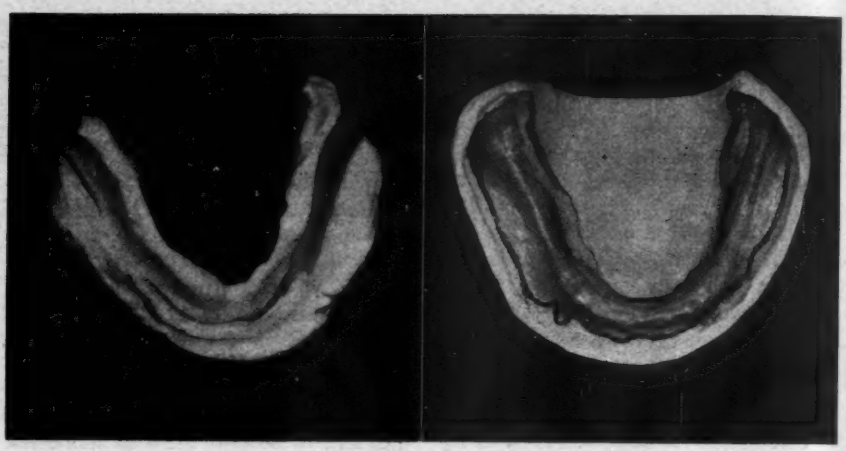


Fig. 3.—Final impression and cast

it has proved satisfactory when processed with care, thereby reducing to a minimum the dimensional change inherent in this plastic.

The collection of saliva along the border of the denture, through seepage, will thicken the separating film between the denture and the ridge. For this reason the periphery of the lower denture should be as thin as possible, thus offering little or no opportunity for the accumulation of saliva at this point. This effect is even more marked in the mouths of patients with new dentures where the increased salivation is a serious handicap to retention of the lower denture. The effects of this temporary oversecretion of saliva can be overcome by the use of hard candy which sweetens the saliva and thus encourages frequent swallowing.

Summary

Briefly the impression technic for full dentures may be divided into two steps: (1) preparation of modeling compound trays which have been muscle trimmed and which are then reduced free of tissue contact and (2) use of alginate, an impression material which has excellent flowing properties at a consistency that enables it to copy all details and fill in deficiencies.

Retention is based on perfect contact relationship between the artificial denture and the underlying tissues in their passive state.

Comfort to the patient is afforded by a denture which gains retention on contact with relaxed and undisturbed soft tissues.—*1771 West Ninth Street.*

Definition of Health.—Health is "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. . . . The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social standing."—*From the Constitution of the World Health Organization, signed July 22, 1946, by representatives of sixty-one nations.*

GROWTH OF MANDIBULAR JOINT IN NORMAL MICE

Barnet M. Levy, D.D.S., M.S., St. Louis

PHYSIOLOGIC aging of the skeletal tissues is mirrored in the changing histologic picture. This is particularly true of the growth zones. The changes taking place in the growing cartilage of the leg from early periods of growth through later stages of the mouse's life have been studied by Silberberg and Silberberg.[1] The age changes taking place in the mandibular joint in the rat have been reported by Cabrini and Erasquin[2] and by Collins and others.[3] Systematic histologic studies of the growth of the mandibular joint of normal mice are lacking. This work was undertaken to study such growth changes and to establish a standard on which to base future studies of changes of the mandibular joint in mice.

Material and Methods

Forty-three male mice belonging to the closely inbred strain C57 black were used in this study. All animals were maintained on Purina Laboratory chow; water was available at all times. The animals were killed at various stages. At autopsy, the head was severed from the body, the skin was removed and the skull was freed from the greater part of adherent tissues. All heads were split longitudinally and fixed in 10 per cent neutral formalin for at least forty-eight hours. To remove the mandibular joint two cuts were made through the head, one posterior to the eye and the other just anterior to the ear (Fig. 1). The blocks of tissue thus obtained were decalcified in formic acid and embedded in paraffin according to the technic described by Morse.[4] Serial sections were cut in a frontal plane at 8 microns and stained with hematoxylin and eosin. All photomicrographs were taken with the Leitz photomicrographic camera, 10:1 objective, 10 × ocular and 25 cm. bellows extension.

Findings and Discussion

Except for the size of the tissue and age changes which will be pointed out later, the gross anatomic structure of the mandibular joint of the mouse is identical to that of the rat.[3]

The cranial portion of the joint, which is membranous bone, is composed at birth of fibrous tissue. With increasing age, this tissue undergoes calcification, ossifies and conforms to the changing shape of the condyle. It remains covered by fibrous tissue throughout the life of the mouse. However, this bone shows no evidence of cartilage-like tissue, such as that found in the rat.[2] The bone changes with age. There is an increase in density and restriction of the marrow spaces, and the fibrous tissue covering the bone at the articular surface hyalinizes.

The interarticular disk of the newborn mouse is composed of a loose connective

Department of Oral Pathology, Washington University, School of Dentistry.

1. Silberberg, M., and Silberberg, R., Age Changes of Bones and Joints in Various Strains of Mice. *Am. J. Anat.* 68:69 (January) 1941.

2. Cabrini, R., and Erasquin, J., The Articulation of the Temporomandibular Joint of the Rat. *Rev. Odontal de Buenos Aires* 7:1 (July) 1941.

3. Collins, D. A.; Becks, H.; Simpson, M. E., and Evans, H. M., Growth and Transformation of the Mandibular Joint in the Rat. I. Normal Female Rats. *Am. J. Orthodont. & Oral Surg.* 32:431 (August) 1946.

4. Morse, Anna, Formic Acid—Sodium Citrate Decalcification and Butyl Alcohol Dehydration of Teeth and Bones for Sectioning in Paraffin. *J. D. Res.* 24: 143 (June-August) 1945.

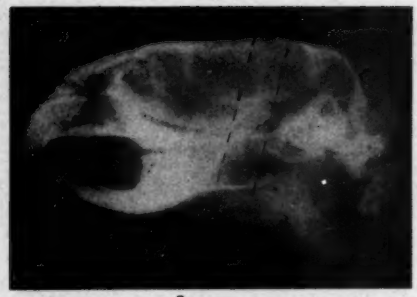


Fig. 1.—Roentgenogram of head of mouse 250 days old. Lines show where cuts were made for removal of mandibular joint

tissue. This tissue soon takes on a denser appearance. In an animal 6 days of age the disk is well formed. Fibers of the external pterygoid muscle can be seen extending high into the disk during the first ten days of life. As the disk ages it becomes less cellular, thinner and denser, and hyaline changes occur in animals more than 150 days old.

In the mandibular portion of the joint at 1 day of age (Fig. 2, upper left), the condyloid process shows early calcification and ossification, but the condyle is composed entirely of cartilage. Between some of the cartilage cells a small amount of basophilic chondromucoid matrix can be seen. Most of the cartilage cells in the condyle are large, round, hypertrophic cells, many of which show vacuolization of the nuclei. A thin layer of flat-resting and undifferentiated cartilage cells is seen at the articular surface. Near the innermost portion, the hypertrophic cartilage cells show evidence of capillary infiltration, and the nuclei in this region show karyolysis. Congested capillaries have advanced from the bone marrow, opening the hypertrophic cartilage cells and destroying them. The capsules are preserved somewhat longer than the cells, and their longitudinal parts persist as calcareous processes. Proliferating connective tissue cells, which later are converted into ellipsoid or round epitheloid osteoblasts, surround these processes and deposit osseous matrix, which calcifies and becomes trabecular bone. The periosteum, which is composed of fibroblastic tissue, shows intramembranous bone formation.

At 6 days of age the appearance of the condyle is similar to that at 1 day, except that matrix formation is increased and there is greater evidence of osteogenesis at the zone of erosion.

By 12 days of age (Fig. 2, upper right) the cartilage is narrower; the hypertrophic cells are less numerous, and the proliferating cells, as well as the resting undifferentiated cells, are more numerous. The condylar process is well formed, and the trabeculae are increased in thickness.

By 14 days of age (Fig. 2, lower left) the width of the cartilage cap has decreased greatly, although the cartilage is still rather rich in cells. At this age in a mouse one can see the zones described by Collins[3] for the condyle of the rat at 25 days of age. The outermost zone, beneath which is the intermediate zone, followed by the zone of hypertrophic cartilage and the zone of erosion are distinct. The ramus of the mandible is increased in width and thickness by periosteal bone formation. Ossification of the endosteum is now prominent. Numerous osteoblasts are seen just beneath the zone of erosion; they are arranged in palisades and surround the trabeculae of the primary spongiosa. Occasional osteoclasts are found, especially in those regions in which the newly formed trabeculae are adjacent to the cortical bone.

At 28 days of age (Fig. 2, lower right) the condyle and the ramus of the mandible are well formed. The bone of the condyle is covered by a crescent-shaped hyaline cartilage. At the articular surface there is a thin layer of dense connective tissue. Just beneath this layer are small chondrocytes separated by wide bars of hyaline ground substance. Beneath these the cytoplasm of the chondrocytes has increased in size, and the cells tend to be

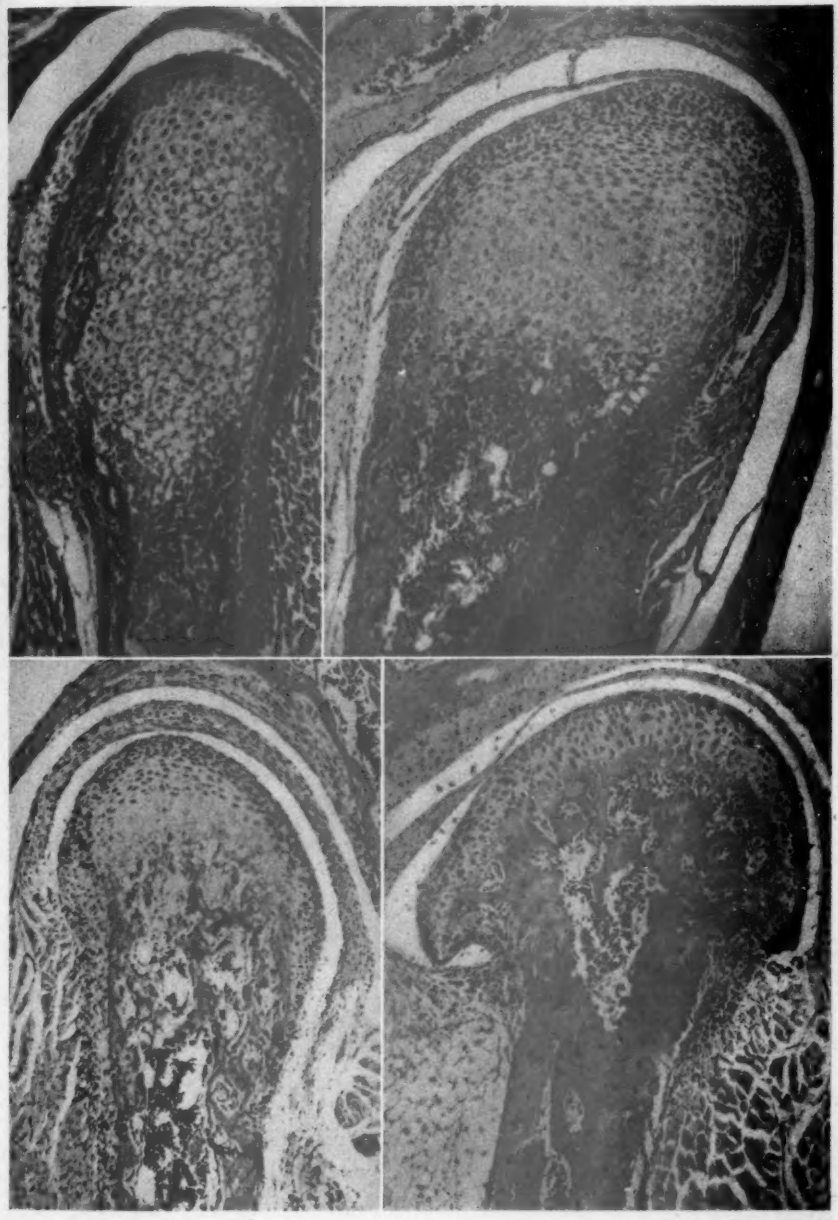


Fig. 2.—Photomicrographs of mandibular joint of mice of various ages: Upper left: 1 day. Upper right: 12 days. Lower left: 14 days. Lower right: 28 days

arranged in short columns. In the zone of erosion the chondrocytes show signs of degeneration, and their capsules are opened by the cells of the proliferating connective tissue. This cartilage is being actively destroyed and new bone is being formed around the remaining cartilage spicules, as is evidenced by the large number of osteoblasts in this area. The spongy trabeculae, which end at right angles on the inner surface of the cartilage, surround relatively narrow marrow spaces. The

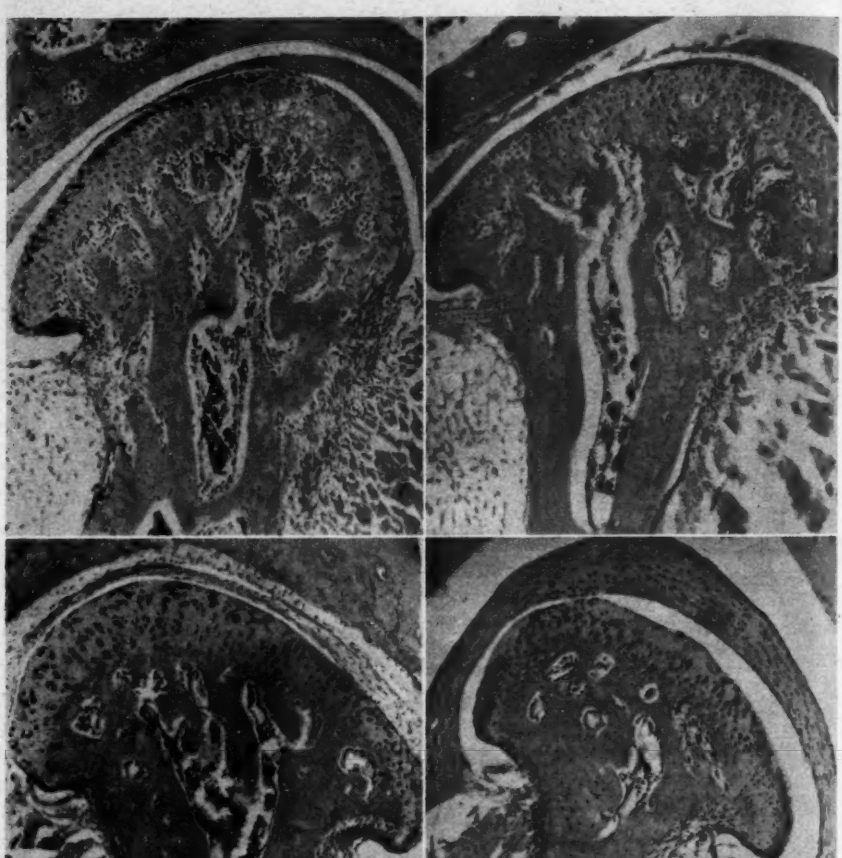


Fig. 3.—Photomicrographs of mandibular joint of mice of various ages: Upper left: 32 days. Upper right: 45 days. Lower left: 90 days. Lower right: 155 days

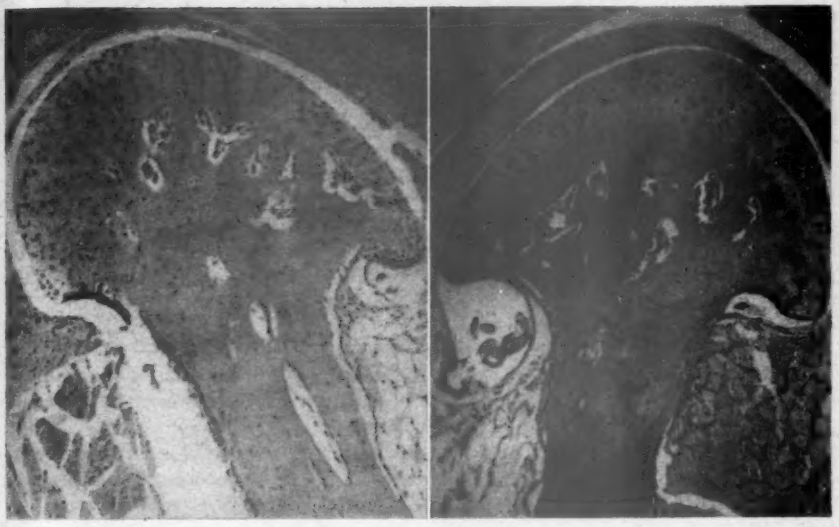


Fig. 4.—Photomicrographs of mandibular joint of mice 285 days old (left) and 540 days old (right)

capillaries at the zone of erosion are reduced in number. This is evidence of reduction in the intensity of osteogenesis. There is more hemopoietic marrow, and it extends closer to the zone of erosion.

By 32 days of age (Fig. 3, upper left) the diameter of the condyle has increased greatly as has the diameter of the ramus of the mandible. At this age chondrogenesis and osteogenesis definitely are slowed. In the cartilage more matrix is present in both the intermediate zone and the hypertrophic cartilage zone. The cells in these zones are smaller than the cells in these zones at earlier ages. Trabeculae of bone now extend to the cartilage, so that the area of contact between the marrow and the cartilage is reduced. There are, however, many osteoblasts arranged in palisades surrounding the trabeculae of bone, and there is still evidence of invasion of the chondrocytes by proliferating connective tissue.

By 45 days of age (Fig. 3, upper right) the hypertrophy of cartilage cells decreases and calcification increases. There is little contact between the cartilage and the vascular elements of the marrow. Contributing to this separation is a fairly broad discontinuous transverse lamella of bone, indicating a slowing of lengthwise growth. Calcification of the hypertrophic cartilage cells is marked. The trabeculae are thicker and have fused so that the marrow spaces are more restricted than at earlier ages. The ramus now is composed of a much more compact bone. This process continues through the age of 2 months. By 3 months (Fig. 3, lower left) the appearance of the condyle has changed greatly. The cells of the most peripheral zone are still distinct and are as numerous as at earlier stages, but the cells of the deeper layers are decreased in number as well as in size, the cartilaginous ground substance being correspondingly increased. The large hypertrophic cells are scarce, and the zone in which they had been present shows widespread sclerosis of the matrix. Osteoblasts, however, can still be seen beneath the cartilage, and although this cartilage

is relatively inactive, it still contains a definite growth potential.

There is a progressive calcification of the cartilage and a consolidation of the trabeculae, as illustrated in Figures 3, lower right, and 4, left, representing the condition in 155 and 285 day old mice. Even in these older animals, hypertrophic cartilage cells still are seen, as are osteoblasts. The size and number of the cartilage cells have been greatly reduced even in the intermediate zone, and one sees a corresponding increase in ground substance. The oldest animal studied was 540 days old. By this age (Fig. 4, right), the hypertrophic and intermediate zones are hyalinized and calcified, but the zone of undifferentiated cartilage cells still is present. Thus the growth potential of the condyle remains. In some animals (Fig. 3, lower right) there is an increase in the number of cells in the undifferentiated and intermediate zones. This is true to a lesser degree in other animals (Fig. 4, right). This hyperplasia may be comparable to the forerunner of degenerative lesions seen in other joints. The bone of the condyle is extremely dense.

As Cabrini and Erasquin[2] pointed out, the most important growth center of the mandible is the cartilage of the condyle. The mandible grows in length at the condyle; the ramus grows in height at the condyle and at the tip of the coronoid process. Owing to condylar growth, the mandible moves anteriorly and inferiorly.[5] Since condylar cartilage grows by apposition of new material, it can be readily seen that, even in older animals, the cartilage retains its growth capacity.

Summary

The growth of the mandibular joint of C57 strain mice from birth to 540 days is described.

Although most of the cartilage covering the condyle becomes hyalinized and calcifies, the undifferentiated zone persists.

The growth potential of the mandible is not lost with age.

The ramus of the mandible becomes extremely dense with age.—*4559 Scott Avenue.*

5. Sicher, H., and Weinmann, J. P., Bone Growth and Physiologic Tooth Movement. *Am. J. Orthodont. & Oral Surg.* 30:109 (March) 1944.

Nutrition Services in Public Health.—The classic studies of Goldberger on pellagra, Marine and Means on iodine-deficiency goiter, and the later studies by Dean on fluorine in relation to dental caries should serve as examples of the types of fact-finding that could be done by state health departments either singly or in regional groups. These studies were directed at specific problems known to exist and not at multiple problems as has so often been done in so-called community nutrition surveys. The latter have too often been superficial in character ending up with reams of data and practically nothing regarding etiology of conditions found. A crude analogy might be drawn to these two approaches as follows: Aiming a rifle at a specific target as compared with firing both barrels of a shotgun aimlessly, hoping that something will be hit. We would do well to consider the single-problem type of study of the etiological variety as providing the fundamental knowledge so greatly needed at the present.—*Walter Wilkins, "New Types of Activity for Nutrition Services in Public Health." Milbank Memorial Fund Quar. 25:247, July 1947.*

COMMUNITY ECONOMIC STATUS AND THE DISTRIBUTION OF DENTISTS

John T. Fulton, D.D.S., Washington, D. C.

THE uneven distribution of dentists in the United States on a national or regional basis[1] as well as within individual states[2] plays a vital part in limiting good dental health objectives. The closing of the gap between dental needs and dental services will require the location of dentists in many areas which evidently are unattractive at the present time. It seems important to know, therefore, what factors produce a favorable area for dental practice and how they operate in influencing dentists to choose a location.

The widely held view that "dentists go where the money is" seems to be substantiated in a recent paper by Bagdonas[3] who shows that ". . . States with a high population-dentist ratio also have a very low per capita income, while those with a high per capita income have a lower population-dentist ratio." Intrastate ratios likewise are affected, according to Mountin,[4] who says, "In general, counties with the lower per capita income classifications had fewer dentists per unit of population."

These studies underscore economic status as a powerful community factor in determining the choice of a dentist's practice location. Realistic program planning must consider these factors, and the need for a technic which is simple yet trustworthy becomes apparent.

During a study of trade areas in Connecticut[5] certain factors were identified which afford useful indexes of the economic status of an area. They are presented here as simple methods of delineating the problem.

The indexes in question are (1) total retail sales per capita, (2) average weekly wage and (3) average monthly rental.

The accompanying figure illustrates the relationships between these indexes and the number of "effective dentists" for each 10,000 population in the twenty Connecticut trade areas. Analysis shows that the ratio of number of effective dentists to population is closely related to total retail sales per capita, and, notwithstanding the few areas concerned, the relationship is significant.

About half of the variation in number of effective dentists for each 10,000 population as between the different trade areas is explainable on the basis of variation in total retail sales per capita. There are significant relationships also between number of effective dentists and average weekly wage on the one hand and average monthly rental on the other.

These relationships are particularly interesting when consideration is given to the fact that Connecticut is small in area, is populated densely and for years has maintained a consistent position among the first four states in per capita income.[6]

Research pedodontist, Children's Bureau, Social Security Administration, Federal Security Agency.

1. O'Rourke, J. T., An Analysis of the Number and Distribution of Active Dentists in the United States. *J.A.D.A.* 31:1097 (August 1) 1944.

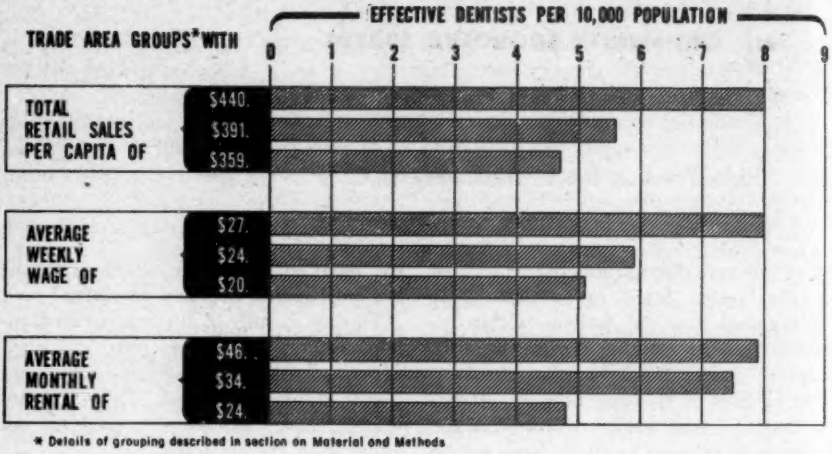
2. *Distribution of Dentists in the United States—1942.* Chicago: American Dental Association, 1942.

3. Bagdonas, J. E., Economic Considerations in Re-establishing a Dental Practice. *J.A.D.A.* 33:4 (January 1) 1946.

4. Mountin, J. W., Trends in Dentist-Population Ratios. *Pub. Health Rep.* 61:1689 (November 22) 1946.

5. Fulton, J. T., Trade Areas as Planning Units. *J.A.D.A.* 33:405 (April 1) 1946.

6. U. S. Department of Commerce, *Statistical Abstracts of the U. S. 1944-45.* No. 66. Washington, D. C.: U. S. Government Printing Office.



Dentist-population ratio and trade area economic status, Connecticut 1939-1940. (By courtesy of Social Security Administration and U. S. Children's Bureau, Federal Security Agency)

It has been shown that the state's dental manpower has increased steadily during the last decade in spite of a static national picture. Furthermore, the annual percentage increase of dentists during that period was substantially more than the state's increase in general population.[7]

One can assume, then, that young dentists not only tend to select a wealthy state in which to practice but also for the same reason are selective about the community within the state. Therefore, any planning for the wider expansion of dental care facilities should consider these economic influences.

The present study suggests a useful fact-finding tool for the public health dentist. Data on total retail sales per capita are obtained easily and may serve as a significant index of community economic status. There are other methods available, such as the one Converse[8] developed to determine county income in Illinois, using as a basis the assumption that a definite relationship exists between family income and rent paid or value of home owned. It is interesting that the present study on monthly rental seems to substantiate the work of Converse even though my method was not as refined.

In my study six possible avenues of inquiry were explored, but the three finally selected were used because they seemed to check with actual community experience. The results follow closely the same pattern in all three indexes which justifies the conclusion that any one of them could serve the purpose of such an investigation.

Material and Methods

One hundred and sixty-one of Connecticut's 169 towns were used as the basic elements of this study. Eight towns were excluded entirely because the bulk of their trading was done in neighboring states.

It seems reasonable that the impact of war might distort the picture with such factors as a great influx of migratory labor, loss of dentists to the armed forces

7. Fulton, J. T., Dental Manpower in Connecticut. II. A Survey of Deaths, Retirements and New Registrations. *Bul. Conn. D. A.* 22:44 (May) 1945.

8. Converse, P. D. *County Incomes and Trade Movement in Illinois.* University of Illinois Special Bulletin No. 4, College of Commerce and Business Administration (January 23) 1945.

and inflated incomes so all data used are for the years 1939-1940, because they were considered to be the most recent normal years.

Data on six items were collected for each town included in the study. Population,[9] total retail sales[10] and average monthly rental[11] were obtained from the U. S. Bureau of Census, the number of workers and wages paid were found in a state report,[12] and the numbers of dentists were determined from an official state directory.[13]

9. U. S. Department of Commerce, Bureau of Census, *16th Census of the United States—1940. Vol. II. Characteristics of the Population.* Washington, D. C.: U. S. Government Printing Office, 1943.

10. U. S. Department of Commerce, Bureau of Census, *16th Census of the United States—1940. Census of Business Vol. I. Retail Trade 1939. Kind of Business by Areas, States, Counties and Cities.* Washington, D. C.: U. S. Government Printing Office, 1941, p. 246.

11. U. S. Department of Commerce, Bureau of Census, *Housing Vol. I. Data for Small Areas. Part I. U. S. Summary and Ala.-Neb.* Washington, D. C.: U. S. Government Printing Office, 1943, p. 208.

12. Connecticut State Department of Labor, Bureau of Unemployment Compensation, *Report on Number of Workers and Wages Paid in Covered Employment. Classified by Local Area, 1940.*

13. Connecticut Dental Commission, *Directory of Registered Dentists, Unlicensed Assistants, and Dental Hygienists in Connecticut* (March 1) 1940.

Total Retail Sales

Total retail sales represent the total sales for each town in 1939 expressed in thousands of dollars. The census tables combine the total retail sales in towns of less than 2,500 population into a single item listed as "remainder of county." Towns in this category were pro-rated a share of this remainder according to their population.

Average Weekly Wage

The data on the number of workers and wages paid do not represent the entire labor force of the towns. The report

Table 1.—Basic data used in analysis of community economic status and the distribution of dentists in Connecticut, 1939-1940 (arranged in order of per capita retail sales)

Trade area	Population	Effective dentists	Effective dentists per 10,000 population	Total retail sales*	Per capita retail sales	Average weekly wage	Average monthly rental
1	298,322	249.0	8.3	$146,629	$492	$26.77	$35.21
2	164,156	148.0	9.0	80,512	490	27.25	67.32
3	43,928	38.0	8.7	21,349	485	20.66	47.20
4	11,386	9.2	8.1	5,099	448	24.17	29.82
5	287,461	224.3	7.8	122,651	427	26.57	37.27
6	66,519	32.3	4.9	27,636	415	24.49	40.58
7	23,799	12.3	5.2	9,833	413	23.94	34.49
8	12,059	4.3	3.6	4,959	411	21.38	40.86
9	210,091	176.1	8.4	86,236	410	28.03	39.89
10	36,879	21.1	5.7	14,967	406	23.96	24.25
11	141,894	97.2	6.9	55,280	390	24.62	29.74
12	45,073	29.1	6.4	17,078	379	21.60	26.85
13	66,310	39.9	6.0	24,612	371	26.11	32.68
14	28,486	12.3	4.3	10,389	365	19.37	27.10
15	78,829	45.2	5.7	28,415	360	28.20	34.68
16	48,676	19.5	4.0	17,391	357	18.73	19.21
17	27,620	13.4	4.9	9,413	341	21.21	40.71
18	41,473	16.9	4.1	13,257	320	25.83	26.86
19	38,108	12.9	3.4	11,879	312	20.25	18.10
20	13,397	8.1	6.0	4,004	299	20.03	23.36
Total	1,684,466	1,209.1	6.1	$711,553	$383	$24.43	$33.71

*In thousands of dollars. Data are for year 1939.

Table 2.—Number of effective dentists and effective dentists per 10,000 population for trade area groupings according to high, middle and low average weekly wage, total retail sales per capita and average monthly rental, respectively, in Connecticut, 1939-1940

Groupings of trade areas according to index specified	Average	Effective dentists	Effective dentists per 10,000 population
*Per capita retail sales**			
Total, 20 areas	$383.20	1,209.1	6.1
Six high areas	440.00	939.8	8.0
Seven middle areas	391.00	196.8	5.6
Seven lowest areas	359.00	72.5	4.7
Average weekly wage			
Total, 20 areas	24.43		
Six high areas	27.00	882.5	8.0
Seven middle areas	24.08	218.1	5.9
Seven lowest areas	20.47	108.5	5.1
Average monthly rental			
Total, 20 areas	33.71		
Six high areas	45.71	412.1	7.9
Seven middle areas	33.50	677.1	7.5
Seven lowest areas	24.08	119.9	4.8

*Data are for year 1939.

included only those people who were engaged in industry and commerce and excluded farmers and domestic workers. However, data are given for 439,871 wage earners, a figure which comprises 57 per cent of the 1940 Connecticut labor force as listed in the census.[14] For the purposes of this study an average weekly wage in each town was determined by first dividing the total yearly wages paid in each town by 52 and then dividing the result by the number of the town's listed workers.

Effective Dentists

A statement of distribution based on numbers alone is questionable because it does not reflect the actual amount of dental service available to the community. Whereas one dentist may spend ten hours a day in his office, another might consider only five hours a day's work. Obviously a rating of such men on an equal basis would misrepresent the dentist population, at least as far as productivity is concerned. In earlier studies of dental manpower in Connecticut, a search for a method which would reasonably account for such variations in practice led to an index of the dentist's age. The rationale of this approach was suggested by Klein's evidence that dentist-age exerts a definite influence on the number of patient services during a week.[15] Using the data on age, a formula was devised to determine a productivity rating. Each dentist so rated is called an "effective dentist." The method, which involves a modification of one of Klein's tables, is given in detail elsewhere.[16]

The data for each town were assigned to the proper trade area and

14. U. S. Department of Commerce, Bureau of Census, *16th Census of the U. S. 1940. Population Vol. III. The Labor Force. Part 2. Report by States, Ala.-Ind.* Washington: U. S. Government Printing Office, 1943.

15. Klein, Henry, Civilian Dentistry in War-Time. *J.A.D.A.* 31:648 (May 1) 1944.

16. Fulton, J. T., Dental Manpower in Connecticut. *Bul. Conn. D. A.* 21:40 (December) 1944.

totaled. In towns that involved different areas the data were divided in the same pattern that was used in the original trade area formation. The complete data for the twenty trade areas appear in Table 1.

In order to simplify the study of the data it was decided to form three groups which would provide a high, middle and low segment, each of which would contain approximately 33 per cent of the trade areas.

The average weekly wage was arranged in descending order, and the resulting array was divided into thirds, with six areas in the highest group and seven areas in each of the others.

The number of effective dentists and the population for each area in each of the three parts were added, and the ratio of dentists to population was determined. The ratio is expressed in terms of number of effective dentists per 10,000 population because small numbers, which are less cumbersome, can be used. This ratio is obtained simply by dividing the number of dentists by the population and multiplying the quotient by 10,000.

The average of the weekly wage in each of the three parts was determined by totaling the average weekly wages for all the towns which went to make up the trade areas used in the group and then dividing the sum by the number of towns involved.

The same procedure was used with the average monthly rental, but the process was altered for the retail sales in order to determine total retail sales per capita. This item was determined by totaling the retail sales for each part and dividing the sum by the total population for each part. The data for the trade area groups are found in Table 2.

Social Insurance in the Soviet Union.—Social insurance in Russia goes back to 1912, when compulsory insurance against sickness and employment injury was introduced. The post-revolutionary scheme dates from 1922, and acquired its present structure and comprehensive scope in 1933. The changes effected in subsequent years have been of relatively small importance apart from the introduction of family allowances—for very large families in 1936 and for families of moderate size in 1944.

The Russian social insurance scheme has a number of outstanding features which, until the last year or two, were to be found in it alone, but some of them have now been incorporated in other national schemes. Thus the Soviet scheme provides cash benefits and certain welfare services in kind, but not medical care, which is a free service furnished by the public health authorities. Liaison between the insurance scheme and the medical care service is maintained by local joint committees. The administration of the scheme is entrusted to the All-Russian trade unions of the different industrial branches and to their local organs. The cost of the scheme is entirely defrayed by contributions proportional to the gross wage bill of each establishment. Payment of contributions is effected, as a rule, by transfer from the bank account of the establishment to the account of the social insurance scheme at the time when the establishment draws cash from its account for the purpose of paying wages. The qualifying period for benefit is expressed in terms of duration of employment, and more particularly uninterrupted employment in the same establishment. Cases of permanent incapacity, whether due to employment injury or to another cause, are classified in three grades of severity, and in other respects also a close assimilation has been achieved between employment injury benefits and the corresponding benefits provided for in cases of sickness, invalidity and death from other causes.—*International Labour Review, 55:361-362, March-April 1947.*

INFLUENCE OF RECENT RESEARCH ON PRESENT ETIOLOGIC CONCEPT OF MALOCCLUSION

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IT HAS been said that facts are the raw materials of progress. This article is concerned with recent research and an improved concept pertaining to the causes of malocclusion. One cannot review modern scientific study or observe the established facts of outstanding research bearing on the causes of malocclusion without a profound respect for the honest and sincere men who have sought to reveal the etiologic factors of malocclusion. Few conclusions have been soundly established, but the work has led to important findings which are of great value in treatment planning. They give us the hope that earnest workers will continue their efforts to establish more conclusive proofs and thus provide a more satisfactory foundation to the concept of the etiology of malocclusion.

There are many dentists who, in attempting to render a helpful service, do not understand the basic growth problems and complex etiologic factors of malocclusion. With them may be grouped an amazing number of orthodontists who adhere to the limited concepts of long outmoded principles. These sincere but misguided dentists neither recognize nor accept recent research findings and stubbornly refuse to follow the newer concepts now available for a more perfect service. On the other hand, there are those energetic enthusiasts who "manufacture" an advanced concept that is beyond the bounds of reason or convincing clinical experience. This has resulted in an alarming confusion which calls for a serious attempt on the part of orthodontists to encourage the application of sound principles in a unified approach to the etiology of malocclusion.

Recent research has made available a more hopeful understanding of the causes of malocclusion and has vividly portrayed a far more satisfactory concept, bringing greater assurance of successful and lasting results following treatment. The fund of knowledge has been increased by the careful and painstaking studies of eminent scientific men who have made bold advances in search of solutions to orthodontic problems. It is necessary to advance into this enlightened era, to discard the old, narrow, and discouraging boundaries and to look to new horizons for improvement in the entire approach to problems of analysis and treatment. The present day concept of the causes of malocclusion is based on recent research of the most careful and accurate studies by distinguished scholars. This newer knowledge is available for clinical application.

Heredity

It seems incredible that orthodontists, professional specialists who should recognize their problems as basically biologic in character, appear to ignore the well established facts of past studies and experience on the one hand and the revelation of newer principles on the other. The problems of the orthodontist are so overwhelmingly biologic in character that it is impossible to overlook the greatest factor—heredity—and its im-

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portant supplements—variation and function.

It is universally accepted that orthodontics is fundamentally concerned with the problem of growth and development and that the character of this problem involves a recognition of every factor which might in any way interfere with normal or optimal maturation of the structures with which the orthodontist is concerned. The orthodontist therefore faces facts which, in their solution, take him deeply into the field of genetics. He must apply the findings in this field to the science of orthodontics if he would recognize hereditary factors as possible causes of malocclusion. Some rather startling revelations which may prove useful in the study of individual cases have been made available. In the light of these newer developments the orthodontist can hardly expect that the beautiful growth pattern, which at one time was believed to be the heritage of every person, can be ideally expressed in the growth and development of the average child. There is reason to believe that an inherited complex, owing to the shifting of genes from chromosome to chromosome, may be such an unbalancing factor as to affect greatly the growth pattern, with the result that certain types of malocclusion are indigenous to such persons. Hughes[1] stated his impressions regarding the variations which concern the orthodontist and his problems, when he wrote: "Nature is concerned with the welfare of each of the genes but does not provide an administrative system or an executive to keep these genes cooperating with each other to maintain the welfare of the individual."

There are three factors in growth and development, that is, three forces of mutual action; namely, heredity, environment and function. With an optimum determination, life is a balance of these forces. "The entire organism develops out of the germ and the organization of the germ determines all the possibilities of development, the actual realization of any possibility is dependent upon environmental stimuli,"[2] Hence the development may be characterized by physical, physiologic, metabolic, neurotic or psychic aberrations. At no time in the life of a person do heredity and environment operate alone.

Variations

Structural indefectives among living things have long been recognized by biologists who have noted that these differences are expressed in many ways and have described them as variations. These variations originally were regarded as imperfections, but it is now evident that variation is one of the most universal characteristics of living organisms. Variation which affects one part may influence other parts, and by the same token function also may be affected. Using this approach to the problems of malocclusion, it would appear that malocclusions may be largely influenced by heredity and environment, or nurture, and that these factors may account for some of the mystifying variations.

The research conducted at the Cornell University Medical School, under the direction of Charles R. Stockard,[3] is of genuine interest to orthodontists. A. Leroy Johnson[4] contributed to this study. Johnson, referring to the results of this study, said: ". . . the hybrid individual descending from two stocks with different lengths or types of jaws may inherit the upper jaw from one stock in association with the different type lower jaw from the other stock. In all probability

1. Hughes, B. O., Nature's Plan and Orthodontics. *Am. J. Orthodont. & Oral Surg.* 31: Orthodont. Sec. 363 (July) 1945.

2. Conklin, E. G., *Heredity and Environment.* Princeton, N. J.: Princeton University Press, 1917, p. 213.

3. Stockard, C. R., *The Genetic and Endocrinic Basis for Differences in Form and Behavior.* Philadelphia: Wistar Institute, 1941.

4. Johnson, A. L., Studies in Genetics of Interest to the Orthodontist. *Int. J. Orthodont.* 19:273 (March) 1933.

this is equally as true for the race hybrids of man."

In commenting on this statement, Strang[5] stated, "If this is true in man, then there is the possibility that there are separate genes controlling the size and form of the maxillae and mandible, and perhaps for tooth size and form, making it possible for the child to inherit the jaw or jaws of one parent and the teeth of the other."

Remarking on this outstanding study in the field of animal biology, Wylie[6] stated: "No matter to what degree I admire the resourcefulness and thoroughness which mark this study by Stockard and his associates, my own knowledge of orthodontic anomalies will not permit me to accept interpretations made with regard to human malocclusion."

There also seems to be ample reason for the orthodontic group to observe carefully and record clinical findings concerning the influence of the endocrine on growth and development of the dental and associated structures. Every orthodontist of long experience has encountered numerous cases of similar familial malocclusions which are of unquestioned hereditary origin, with evidence of endocrine dysfunction. The studies by Stockard should stimulate further research in this particular field. Three important considerations, suggested by Johnson, should be borne in mind in the analysis of every case of malocclusion: 1. Are certain peculiar structural formations of genetic origin, and if so to what extent can they be modified? 2. Do all persons possess equal potentialities of development? 3. Typical development is the guide in the study of occlusion. To what extent shall the dentist try to produce it in the individual?

In the study by Brash[7] of the causes of malocclusion, he concluded: "The main question is whether inheritance or environment, nature or nurture, the genetic constitution or the physiological or pathological conditions or factors in control of growth, are responsible in a broad way for malocclusion and irregularities of the teeth." Primarily, orthodontics is concerned with the growth and development of the face and jaws. Developmental disharmonies and environmental influences affect the growth pattern, and the importance of these factors, known and unknown, is the basis for continued study and research.

Bone Growth

Recent findings pertaining to bone growth have revealed facts of great importance to the orthodontist. Growth of the maxilla contrasts greatly with the growth of the mandible.

The more important sites of growth for the maxillary composite are three sutures on each side: (1) the frontomaxillary suture between the frontal bone and the frontal process of the maxilla; (2) the zygomaticomaxillary suture between the maxilla and the zygomatic bone (and secondarily, the zygomaticotemporal suture in the zygomatic arch); and (3) the pterygopalatine suture between the pterygoid process of the sphenoid bone and the pyramidal process of the palatine bone. It is significant that these three sutures are parallel to each other and are all directed from above and anteriorly downward and posteriorly.[8]

This growth of the sutures has direct bearing on and strongly supports the findings revealed some years ago by Hellman,[9] to which reference will be made later.

Sicher[10] has finally exploded a too long prevalent idea concerning the interstitial growth of bone. He said, "Interstitial growth of bone does not exist, and this

5. Strang, R. H. W., *A Textbook of Orthodontia*. Philadelphia: Lea & Febiger, 1943, p. 126.

6. Wylie, W. L., Heredity and the Orthodontist—A Study in Confusion. *Am. J. Orthodont. & Oral Surg.* 33:Orthodont. Sec. 148 (March) 1947.

7. Brash, J. C., *The Etiology of Irregularity and Malocclusion of the Teeth*. London: Dental Board of the United Kingdom, 1929.

8. Weinmann, J. P., and Sicher, Harry, *Bone and Bones*. St. Louis: C. V. Mosby Co., 1947, p. 92.

9. Hellman, Milo, *Eruption of Permanent Teeth and Accompanying Facial Changes in Physical and Mental Adolescent Growth*. Cleveland: Brush Foundation, 1930.

10. Sicher, Harry, The Growth of the Mandible. *Am. J. Orthodont. & Oral Surg.* 33:30 (January) 1947.

statement is unqualified and unequivocal." Sicher[4] has furnished a most important revelation in this statement. In other words, all bone growth is surface growth. Hence, basal (or foundation) bone cannot be enlarged by forces of mastication. Only the quality and form of the alveolar process is affected by these functional forces. It is therefore hopeless to expect a denture, enlarged by general expansion, subsequently to produce a larger bony base as a result of functional stress because such forces do not influence surface growth. Sicher[3] has made a definite appraisal of the mandible. This interpretation is highly important to orthodontists. He stated (p. 98):

> In the young individual the bony part of the mandibular condyle is overlaid by a cap of cartilage, but this in turn is covered by a thick layer of connective tissue which continues into the periosteum of the mandibular neck. There is an interstitial growth of cartilage but in the mandibular condyle the cartilage grows by interstitial proliferation and by apposition from the deepest layers of the covering fibrous tissue. In addition to growth of cartilage and its replacement by bone, bone tissue itself is laid down at the posterior border of the ramus, at the upper border of the coronoid process, and at the alveolar crest. The mandibular body grows very little by apposition on its lower borders. It grows in height by addition of bone on the free borders of the alveolar process. At the same time, at the anterior border of the ramus, bone is resorbed so that room is provided for the successive eruption of all the teeth.

Recent research has been directed toward definite recognition of the possible causes of malocclusion so clearly stated by Brash[7]: ". . . inheritance or environment, nature or nurture, the genetic constitution or the physiological or pathological conditions or factors in control of growth." It is evident that causes vary in each individual case. However apparent may be the structural deficiencies which are evident in malocclusion, the complex problem in the search for the specific cause or causes requires a sound understanding of every factor or influence affecting the growth pattern.

Functional Forces

The functional forces influencing the maxillary structures have not been uniformly considered in the broad study of malocclusion. It is well known that function of parts has a tremendous influence in the form of structures. It has been recognized from the days when Angle set forth his concept of malocclusion (which marked the beginning of modern orthodontics) that the forces of occlusion were significant and that these forces, working normally or abnormally, influenced tooth positioning.

Strang[5] has done much (in his presentation of the forces of occlusion as related to growth and development) to clarify the concept that these influences play an important part in the functional adaptation of the structures involved in malocclusion. Strang ably portrays the tremendous action of bone growth emanating in the sutures surrounding the great bony buttress of the sphenoid bone, the known growth centers in the maxillary complex and also the unusual growth and development of the mandible. His analysis of the influence of muscular forces—this fine balancing of function of the muscles of mastication and expression with the forward growth urge and functional adaptation of the osseous structures—reveals the necessity of perfect balance of all these factors if form and function are to produce structures which will provide the foundation on which normal occlusion can be established by the erupting teeth. Too long have orthodontists neglected consideration of the influence of the muscle forces. Too long have they failed to recognize that in every case of malocclusion the product or sum total of inheritance, environment, genetic constitution, physiologic or pathologic conditions and

every factor influencing growth and development have produced a result in the individual's dentition which actually is a balance of all these forces. The error may be in the hereditary deficiency of the supporting structures. There may be acquired influences or environmental factors that inhibit the realization of the optimum growth and development essential for perfect occlusion. Nevertheless, these forces—some normal and some abnormal—finally produce a balance, and that balance in its adjustment produces a malocclusion.

Facial Growth and Tooth Eruption

Hellman has made a tremendous contribution to knowledge concerning the growth and development of the face and the causes of malocclusion. It is significant that the studies of Brodie, Broadbent and Sicher bring added proof to all the findings Hellman revealed in his studies of growth and dentition. Hellman analyzed the many and varied growth changes taking place in the maxillary complex. He believed that the growth changes associated with dentition and the development of the face involved a change in form. His postulates reveal that as the face grows there is a change in proportion, and these growth forces, acting reciprocally, effect an adjustment in position; that the two directions of growth chiefly concerned in this adjustment of the face are those of height and depth. Particularly in Sicher's work similar convictions are found as to changes during growth and development in the bones of the face.

Years ago Hellman[9] presented a true picture of these transitional changes associated with the developing dentition. He was convinced that in the development of the dentition the upper and lower portions of the face are wedged apart, bringing additional height to the face. The face grows wider, spreading out laterally with the greater increase posteriorly, particularly in the region of the mandibular angle. The depth of the face is acquired by increments from behind—it really grows backward to accommodate the permanent molars as they erupt. At the same time, the entire facial mask swings forward, the change being greater in the chin region than in the nasal portion. As the face continues to develop, different parts grow at different rates, and with the addition of each molar there is an accompanying increase in the size of the jaws and a forward adjustment of the entire face.

Sicher[8] refined Hellman's findings in facial growth and tooth eruption. He also observed (p. 97) that "the development of the teeth and that of the jaws are highly independent. It is true that the development and growth of the alveolar processes are dependent on the development and eruption of the teeth." Elaborating on the dependence of bone growth and development of the teeth, Sicher said (p. 97):

> The influence of the growth of the facial skeleton upon the eruption of teeth is threefold: (1) The growth of the maxilla and mandible, in an antero-posterior direction, provides the space necessary for the successive eruption of the posterior teeth. (2) The growth of the maxilla and mandible in height, initiated by the vertical growth of the mandibular ramus, is necessary for the free vertical eruption of the teeth. (3) Growth of bone in the maxilla and mandible is one of the forces of eruption.

The alveolar process undergoes change during the shedding of the deciduous teeth and the eruption of the permanent successors. There is a vertical growth of the alveolar process. This change is not an adaptation of the deciduous arch to accommodate the permanent teeth but "an entirely new formation with a typical shape adjusted to the permanent dentition" (p. 96).[8] It is revealing to pursue these many studies in order to evaluate properly all the forces and factors which bear on malocclusion. It

is, for instance, important that this whole problem of growth and development and the forces of eruption be studied thoroughly and correlated carefully with every case under consideration for analysis. Hellman adopted developmental stages, based on patterns of dentition attained during certain periods, correlating developmental changes of the dentition with facial growth. These stages extend from early infancy to the period of senility. Certain stages extend over periods of greatest change, periods of loss of deciduous teeth and appearance of the permanent dentition. One can anticipate the maximum growth period and foresee the period during which orthodontic assistance can more quickly establish the most desirable occlusion.[11]

Broadbent[12] revealed some exceedingly valuable findings in his serial roentgenograms to establish facial growth patterns and to disclose early alterations of form and structural changes of the face. By means of his studies, it is possible to estimate the growth and facial development of children. Brodie[13] has contributed much to the sum of knowledge concerning facial growth and the developing dentition. His conclusions concerning the constancy of the mandibular angle and the fact that growth patterns show progress along parallel lines harmonizes with the convictions of other recognized research workers.[8, 9, 11, 12]

Trends in Treatment

All these noteworthy findings indicate a compelling desire on the part of specialists in orthodontics to solve the etiologic problems of malocclusion. Recent research has been tremendously helpful in establishing an improved method of study for case analysis. Furthermore, present day concepts of the causes of malocclusion have resulted in trends which are greatly at variance with many past beliefs and are sometimes so far reaching that the approach to treatment is entirely changed.

The integrity of the dental units (the teeth) has been a universal principle in orthodontics since the days of Angle. For more than fifty years, the universal acceptance of this concept dominated the thinking and action of the dental profession. Perhaps no one factor was responsible for so many failures among honest and conscientious orthodontists. This precept has discouraged many sincere orthodontists and dismayed the parents of child patients who anticipated lasting results from orthodontic efforts. It is only natural, therefore, that changing trends of orthodontic thought and progress should produce a better understanding of the causes of malocclusion and reveal some of the causes of failures as well as the limitations of treatment which have so greatly affected results in the past.

After years of continued or intermittent treatment, one cannot honestly accept failure in securing ideal functional occlusion with the explanation that the embarrassing result is normal for that person. Back of this complex problem were genetic factors, inherent limitations, environmental influences and limits of tolerance of the structures which in themselves established a natural balance of all component parts and forces, thus making, or tending to make, a person normal. That these limitations appear to have ruled out the integrity of thirty-two teeth in the dental pattern of many cases of malocclusion must be considered seriously. Any of the dental units cannot honestly be eliminated without first arriving at a studied analysis of each case. Only on such an analysis can a corrective plan be evolved which will as-

11. Hellman, Milo, The Face and Occlusion of the Teeth in Man. *Int. J. Orthodont., Oral Surg. & Radiography* 13:921 (November) 1927.
12. Broadbent, B. H., The Orthodontic Value of Cephalometric Studies in Facial Growth With the Roentgenographic Cephalometer: The Use of X-ray Silhouettes in Tracing Facial Growth. *J. D. Res.* 13: 151 (April) 1933.
13. Brodie, A. G., Some Recent Observations on the Growth of the Face and Their Implications to the Orthodontist. *Am. J. Orthodont. & Oral Surg.* 26: Orthodont. Sec. 741 (August) 1940.

sure lasting and permanent results after careful and conscientious orthodontic treatment. The routine elimination of one or more teeth for every patient presented for orthodontic treatment is damaging not only to the practice of orthodontics but also to all of dentistry, and is as reprehensible a concept as was Angle's original precept of the integrity of the thirty-two teeth. Progress is limited and has always been limited by the dogmas which have been based on the fads or fancies of past decades only to be refuted by newer knowledge and by the wisdom which comes with convincing clinical experience.

Orthodontic literature is filled with newer trends or methods of treatment. These expressions of enthusiasm will fade and die, but from all these reported findings will come a lasting conviction that the search for the underlying causes of malocclusion must be the greatest endeavor of the orthodontist. The most acceptable advances in the treatment of malocclusion have been based on some very sound and acceptable studies. In some instances, the lasting results speak more convincingly of the products of the research than of the methods employed in treatment. Why? Because the products of research continue to add to the fund of knowledge of the growing child and will continue to augment such knowledge. Methods of treatment are man-made and will change as knowledge of growth and development improves.

It is difficult for some to harmonize the newer beliefs, as expressed by a rapidly growing school of thought, with the principle that there is an inherent force within the bony structures which, by orthodontic stimulation, will "produce" sufficient bone to support thirty-two teeth in any and all jaws. It is obvious that there are two important and fundamental facts that are either unknown or deliberately ignored by the majority of orthodontists. These two facts must be recognized in the etiologic appraisal and analysis of every case of malocclusion. They are:

No growth takes place in the body of the mandible and maxillae anterior to the first permanent molars after their eruption, and this is the area to which orthodontic treatment is limited in the movement of individual teeth. Nothing can be done to harmonize the bony foundation with the excessive amount of tooth material if the tooth pattern is not in harmony with the bone growth in this area.

All bone growth occurs by surface additions and not by growth within the bone, pushing the compact surface layers outward. Functional stimulation, subsequent to expanding a denture, cannot enlarge the basal bone, for masticatory stress is received within the bone and tends only to strengthen those bone trabeculae that resist this thrusting force.[14]

There will come a day when the classical studies of Nance[15] will mark the beginning of a better concept of orthodontic problems and the methods to be employed in meeting these problems. His studies furnish some of the most important highlights in the entire field of orthodontic research, for he has related careful research studies to treatment and has secured lasting results. This article is not concerned with treatment but does recognize that specific findings bring improvement to orthodontics if the newer concepts add stability to the dentition after an honest effort to establish a pleasing, esthetic and functional occlusion within the structural limitations of inheritance, environment and functional adaptation. Nance has shown convincingly that stability of the dentition is dependent on the correct positioning of the teeth over foundation bone; that the correction of any and all cases of malocclusion is not the result of stimulating bone growth but depends rather on an accurate appraisal of the amount of bone available and the movement of the teeth into their proper relation in each arch and into perfect occlusion, even though

14. Strang, R. H. W., Personal communication.

15. Nance, H. M., The Limitations of Orthodontic Treatment. *Am. J. Orthodont. & Oral Surg.* 33: Orthodont. Sec. 177 (April); 953 (May) 1947.

the bony structure is so limited in quantity that the elimination of some of the teeth may be necessary to assure lasting results. The most satisfying and revealing results will be secured if Nance's suggestions are followed in the analysis of each case of malocclusion.

Although this article has largely considered the complex problems associated with malocclusion in which marked aberrations are present, it is well known that many cases presented for orthodontic treatment possess adequate bone substance to accommodate the tooth structure present. The correction of simple malocclusion is not easy, and the correction of the more complex malpositions is extremely difficult. One is thoroughly convinced that it takes far more courage to overexpand in an effort to gain space for malposed teeth, if basal bone area is insufficient, than to subtract tooth substance. Remembering this important fact will assure far more satisfying results after careful case analysis and treatment planning.

Summary

Recent research has had a most favorable influence on the concept of the causes of malocclusion. In fact, the present concept assures a more adequate understanding of orthodontic problems and gives the orthodontist a more positive approach to case analysis and treatment planning. The most noteworthy results of recent research concerning the structures of the face and jaws may be summarized as follows:

Interstitial bone growth does not exist. Growth of cartilage in the mandibular condyle does occur by interstitial proliferation and by apposition from the deepest layers of the covering fibrous tissue.

At no time in the life of a person do heredity and environment operate alone.

All the inherent factors and environmental influences must be maintained in perfect and normal balance for the normal development of occlusion.

Growth of bone in the maxillae and mandible is one of the forces of eruption.

The present concept discards Angle's postulate concerning the integrity of the thirty-two teeth in many cases of malocclusion.

No growth takes place in the body of the mandible anterior to the first molars after their eruption.

All bone growth occurs by surface addition. Orthodontic treatment will not stimulate bone growth.

Stability of the dentition is dependent on correct positioning of the teeth over foundation bone.

Permanent and lasting results in establishing esthetic and functional occlusion depend on the structural limitations of inheritance, environment and functional adaptation.—*1726 Eye Street, North West.*

Status of Tuberculosis Control.—The best available single index as to the status of tuberculosis control is and always has been the mortality rate from this disease. The success of the tuberculosis program is best measured by the steady decline in the death rate during the past several decades. It is an impressive fact that tuberculosis mortality in the country as a whole has declined 53 per cent between 1924 and 1944.

The drop in tuberculosis mortality varies widely in the sex and color groups. The greatest decline in the past 20 years, for example, has been registered in the death rate for white women among whom the drop was 67 per cent; among nonwhite men, on the other hand, tuberculosis mortality declined but 42 per cent during the same period.—*Mary Dempsey, "Decline in Tuberculosis Death Rate Fails to Tell the Entire Story." Am. Rev. Tuberc., August 1947.*

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EDITORIALS

THE ADMINISTRATION OF PENTOTHAL SODIUM IN GENERAL PRACTICE

Ever since Wells demonstrated that surgical pain could be prevented by the inhalation of nitrous oxide, surgeons have awaited the discovery of a perfect anesthetic agent. For the better part of the past century the choice of general anesthetics was limited to nitrous oxide, ether and chloroform. These three anesthetics served their purpose admirably, but none of them was perfect. Recently, researchers, armed with newer knowledge in chemistry and physiology, have added to the anesthesiologist's equipment by providing a number of anesthetic agents, including ethylene, Vinethene, cyclopropane and Pentothal sodium. Of these, Pentothal sodium, or, as it is more rightly termed, thiopental sodium, seems to hold the current interest of dentists. Although Pentothal sodium has made a place for itself in the offices of some oral surgeons, it is unlikely that it ever will be used extensively by the general dental practitioner. Those who use it must have long and extensive training in its administration, and offices in which it is used must be equipped with special facilities and adequate space to care for those patients to whom it is administered.

In two articles in this issue of THE JOURNAL, one by Schultz and Guralnick (page 140) and the other by Roberts and Brown (page 150) are discussions of the properties and administration of this latest anesthetic agent. Schultz and Guralnick, from their extensive background of experience during the war, state that "Pentothal sodium, intelligently used, is an excellent anesthetic for not only hospital use, but office use as well." They caution, however, that the dentist employing it should have special training and equipment. They recommend the addition of curare to the Pentothal sodium-nitrous oxide-oxygen combination as a method of handling the patients with the more complicated maxillofacial conditions in whom maximum relaxation and intubation are essential.

Roberts and Brown caution that Pentothal sodium never should be administered

without oxygen and equipment for endotracheal intubation at hand to safeguard against the possibility of respiratory obstruction. According to these authors, Pentothal sodium should not be administered to patients who show any indication of dyspnea or marked cardiac disease, nor should it be administered to a patient who has any swelling in the throat or infection in the neck. In their opinion, Pentothal sodium is not a desirable anesthetic agent for children less than 14 years of age. On the other hand, these authors believe that it is an ideal anesthetic for the alcoholic, the outdoor type of person and the highly nervous patient. Like others who have had extensive experience with this drug, Roberts and Brown point out that because Pentothal sodium is a marked respiratory depressant it should be administered only by trained anesthetists. They state, "The dose of an intravenous anesthetic, once in the vein, cannot be reduced nor can it be eliminated with the ease with which an inhalation anesthetic can be eliminated."

Seldin[1] also is cautious in advocating the use of Pentothal sodium. It is his opinion that "this drug does not lend itself to unrestricted use as a principal anesthetic in prolonged oral surgery in the office because it is potentially dangerous if infections of the floor of the mouth or cellulitis of the neck are present. . . . As a synergist, however, in operations free of involvement in the danger regions and in those of moderate duration, Pentothal sodium is most satisfactory."

Barton, Wicks and Livingstone[2] have shown that when 50 per cent each of nitrous oxide and oxygen is employed with Pentothal sodium only about a fourth as much Pentothal sodium is required to maintain the same plane of anesthesia as when Pentothal sodium is administered alone or with 100 per cent oxygen. "This is important," they stated, "since Pentothal has a cumulative and not always desirable or predictable effect when more than 1 or 1.5 gm. is administered."

The careful studies made by these and other researchers on Pentothal sodium, as well as on other general anesthetic agents, indicate that the administration of anesthetic agents is no longer on an experimental basis and that only those especially trained in the use of these drugs should undertake to administer them. Until about twenty-five or thirty years ago the administration of a general anesthetic agent consisted largely in putting the patient to sleep and trusting that he would recover from both the operation and the anesthesia. Today the dangers of anesthesia are as great as ever, but a competent anesthetist recognizes these dangers and knows how to deal with them. An experienced anesthetist, however, is not necessarily a thoroughly competent one. The American Board of Anesthesiology believes that no anesthetist is truly competent until he or she has been graduated from a Class A medical school and has had at least one year of approved internship, two years of hospital residency and three more years of full time practice in anesthesiology, or a total of nine years of intensive training. The standards set up by the American Board of Anesthesiology may be so high that they are impractical. They are cited here merely to emphasize the vital importance of using every precaution in administering a general anesthetic.

There are those who believe that all general anesthetic agents, including Pentothal sodium, should be administered only in a hospital. There are others who do not agree. A survey made by Seldin[1], based on the administration of an anesthetic agent in 2,429,148 cases in routine oral surgical practice in the office covering a period of five years, revealed only 15 deaths (1 in 161,943 cases) in contrast to 1

1. Seldin, H. M., Nitrous Oxide and Potent Synergists in Oral Surgery. *J. Oral Surg.* 5:131 (April) 1947.
2. Barton, S. D.; Wicks, W. R., and Livingstone, H. M., The Effect of Pentothal Alone and in Combination with Oxygen or Nitrous Oxide-Oxygen on Arterial Blood Gases. *Anesthesiology* 7:505 (September) 1946.

death in every 1,000 cases during administration of anesthetics in hospitals, as reported by Waters and Gillespie.[3] Seldin pointed out, however, that the anesthetic and surgical risks encountered in hospitals are invariably more serious and much more prolonged than in those cases in which an oral surgical procedure is performed in the private office. Judging from Seldin's study and from the practical experience of thousands of dentists, general anesthetic agents can be administered in a private office just as effectively and safely as in a hospital, provided the dentist, anesthetist and assistant are capable of furnishing the patient with competent service and are prepared to combat effectively all complications that might arise.

The precautions that surround the administration of general anesthetics apply with extra force to the use of Pentothal sodium. Most dentists will weigh the ease of its administration against its known effect as a respiratory depressant. They will weigh the satisfaction of the patient against the special training, special equipment, additional personnel and space required for successful administration of the agent. On evaluation of these advantages and disadvantages it is unlikely that many dentists will add the use of Pentothal sodium to their already overloaded schedule of practice.

3. Waters, R. M., and Gillespie, N. A., Deaths in the Operating Room. *Anesthesiology* 5:113 (March) 1944.

THE WOMAN'S HOME COMPANION OVERSIMPLIFIES THE LABORATORY PROBLEM

THE *Woman's Home Companion,* using the technics of "fear advertising" so readily to be found in its own advertising columns, has discovered "bootleg dentistry." An article, "Bootleg Dentistry" by Clive Howard,[1] appears in the January issue and provides the basis for a national promotional campaign which plugs the magazine in full page advertisements in many of the newspapers of the country. The circulation building values of such medical and quasimedical articles long have been recognized by the *Woman's Home Companion* which, as the *Health Center Journal*[2] said recently, "carries almost as high a proportion of medical material as the *Journal of the American Medical Association.*"

This widespread interest of large circulation media in health education, in many instances, has been laudable. But when, under the guise of health education, an article is used to mask the presentation of certain partisan viewpoints designed to preserve commercial and competitive advantages, then the benefit to the public is at an irreducible minimum.

"Bootleg Dentistry," knowingly or not, glibly advances "solutions" that have been rejected as unsatisfactory by the dental profession but not by some laboratories which hope ultimately to build a case for serving the public directly. It repeats the time-worn fallacy that individual examples of irregularity and incompetence found in every walk of life can discredit a whole profession. It fronts for the commercial groups which believe that the ownership of special mechanical gadgets is incon-

1. Clive Howard, Bootleg Dentistry. *Woman's Home Companion* p. 43 (January) 1948.
2. Health Center Journal. 1:40 (December) 1947.

trovertibly essential to the rendering of a competent health service. It reiterates the canard that the majority of dentists are unable to evaluate the worth of a prosthetic appliance merely because they themselves do not apply the blowtorch to melt the metal of which the appliance is composed. It makes the usual threat of the self-appointed crusader who offers little but rhetoric to solve a problem: "Unless the dentists act first to clean up this unsavory side of their profession, some day an aroused public may do it for them."

Such intervention by an aroused public would be welcomed by the dental profession. Long before the *Woman's Home Companion* discovered "bootleg dentistry," the profession had been almost alone in recognizing the dangers to public health inherent in it. Largely through the efforts of dentists and dental societies, laws have been enacted in every state which, when enforced, can control illegitimate dental practice by technicians, laboratories or anyone else. Dental societies are not official agencies and cannot enforce laws but almost every society maintains a committee to aid proper authorities in such enforcement. The fact remains, however, that the lack of enforcement of dental laws represents one of the worst areas of neglect in modern public health practice. Undermanned enforcement agencies, lack of appreciation of the danger to health that is created through illegal dentistry and simple indifference to statute are the greatest breeders of illegal dental practice.

The problems involved, however, are not as amenable as the oversimplifications of the article in the *Woman's Home Companion* would imply. For the past five years, the Committee on Prosthetic Dental Service of the American Dental Association and its many state level counterparts have been studying this matter. The Association has recognized "the dental laboratory technician and the dental laboratory as essential adjuncts of the dental profession but in no sense as independent agencies capable of rendering a health service to the public."[3] It has designed a program of accreditation for dental laboratories, and this program is working satisfactorily in several of the states. It has considered additional legislation for laboratories and technicians but is unwilling to commit itself to such a program (1) until present laws are effectively enforced and (2) until there is assurance that further legislation will not result in dental practice by ill trained and unqualified technicians. It has fostered the development of courses for dental technicians under the auspices of the dental schools. It repeatedly has urged the formation of a single unified organization which could represent the laboratories nationally, correct some of the obvious abuses which now exist in the fringe of the craft and meet more generally the high standards required by the dental profession. The Association has worked continuously with the nation's many legitimate laboratories which are doing their utmost to render service of high quality to the dental profession.

To the extent that it arouses public opinion for better law enforcement, the article is helpful. To the extent that it uses false assumptions and misinformation to build an ill considered solution, it is not.

3. *Transactions of the American Dental Association, 88th Annual Meeting, August 4-8, 1947*, p. 244.

INTERNATIONAL CORRESPONDENCE

News From Great Britain

Royal Dental Hospital of London

The Royal Dental Hospital of London has been in the news twice recently. On October 11 the Annual Conversazione and Presentation of Prizes was held at the hospital. Professor Harry Stobie, the dean of the hospital and school, submitted his report for the year 1946-1947. He mentioned the difficulties which were being experienced in finding accommodation for the large increase in the number of students. In the hospital certain structural alterations were being carried out, and he hoped that these would help to overcome the shortage of accommodation. He drew attention to the successful six months' postgraduate course in orthodontics which was just ending.

Sir Ernest Graham-Little presented the prizes. Sir Ernest was born in South Africa and received his early education there. He came to England to study medicine and afterwards practiced in London. He has represented the University of London in the House of Commons for the past twenty-five years as an Independent member. He is a consulting physician to the skin department of St. Mary's Hospital, London. In his address to the students Sir Ernest drew attention to the great changes that are taking place in the medical and dental professions today. He traced the steps by which the present National Health Service developed, and he was critical of the fact that neither this nor the preceding government had sought the opinion of the professions in the preparations for the Beveridge Report or the National Health Service Act of 1946. He drew attention to the fact that in the Education Act the shortage of qualified teachers had been alleviated by uncertificated teachers. He wondered whether the government might not adopt a similar procedure with regard to some section of practice under the National Health Service—clearly a reference to dilution of the dental profession by hygienists and technicians.

The second event at the hospital was the thirty-first Annual Clinical At Home on November 22. The program included two lectures, one on "Photography in Dentistry," by H. R. Mandiwall, director of the newly established Department of Clinical Photography and Visual Education in the school, and the other on "Twenty-Five Years of Dental Anesthetics," by Dr. Karn. The demonstrations included minor oral surgical procedures with the patients under local anesthesia, major oral surgical operations with the use of endotracheal anesthesia and surgical treatment in connection with orthodontic treatment. C. Bowdler Henry presented a series of cases of Kostecka's operation for reduction of mandibular prognathism. Demonstrations were given of cases of prosthetic interest, and operative dentistry was represented by incisal tip inlays and direct inlay wax impression technic. Speech therapy, clinical cases, dental electrotherapy, problems in prosthetics and an exhibition of roentgenograms and clinical photographs completed the demonstrations.

Portrait Presentations

At the At Home previously mentioned a portrait of J. G. Turner, painted by John Heath, a dentist in Melbourne, Australia, was presented to the Royal Dental Hospital of London by the Rt. Hon. J. A. Beasley, High Commissioner for Australia. J. G. Turner has retired from active practice now, but for many years he was on the staff of the Royal Dental Hospital of London and later was curator of the museum. He is a man of wide clinical experience and has an excellent sense of clinical judgment. He has been a source of great encouragement to young research workers who always have been eager to have his advice and help. He is a life member of the British Dental Association and is the appointed representative of the association to the Australian Dental Congress in 1948.

In the headquarters of the British Dental Association in London Sir Frank Colyer recently unveiled a portrait of the late Professor William Henry Gilmour of the Liverpool Dental Hospital, painted by the same artist and presented by him to the association. Among the many honors that Professor Gilmour received in a long life devoted to the advancement of dentistry was the LL.D.

degree of the University of Pennsylvania. He ranks with the greatest dental teachers this country has ever had. His name always will be linked with the Liverpool Dental School for which he strove so hard. Operative dental surgery in Britain owes much to the influence of Dr. Gilmour, who was a master in the use of gold foil.

National Health Service

No date has yet been announced when the regulations governing the National Health Service Act will be made public by the simple action of laying them on the table in the House of Commons. This date is eagerly awaited. The regulations will lie on the table for forty days, and during that time only can amendments be proposed. The three associations are preparing an analysis of the regulations on such confidential information as they possess so that as soon as possible after the date the members will have information on the implications that are contained in the regulations. Meetings are being arranged provisionally so that members will have the opportunity for discussion, for airing their views and for getting questions answered and difficulties solved by one of the acknowledged experts on the subject. The various meetings will vote, and ultimately the association will arrive at a policy which will represent the feeling of the majority of the members.

The Spens Committee

The Spens Committee continues to receive information from various sources, and it is estimated that it will be a few months before the report can be presented to the Minister of Health.

Amalgamation of the Three Associations

The amalgamation committee of the three associations met last on October 22. In order that the urgent matter of unity can be pressed forward with all speed, various subcommittees have been formed to deal with such subjects as staffing and accommodation, finance, professional risks and insurance. It is hoped that an independent chairman will be elected at the next meeting. It is estimated that, at the earliest, two years must elapse before unity can be achieved.

Anticoagulant Effect of Penicillin

Considerable interest has been aroused by the paper of Sir Alexander Fleming and E. W. Fish on the anticoagulant effect of penicillin published in the August 16, 1947, issue of the *British Medical Journal*. In this paper it was pointed out that penicillin placed in a cavity such as is frequently found in dental practice often creates such a high local concentration that the effect is to reduce the coagulability of the blood. Persistent bleeding and lack of clot formation will result, as has been experienced by a number of practitioners after such operations as apicectomy and removal of third molars. The authors point out also that the quality of the clot is poor once it is established. Consequently they advocate only syringing of the cavity with a solution of not more than 100 units of penicillin per cubic centimeter. Penicillin is used extensively in dental practice in Britain.

International Surgical Congress

The International Surgical Congress held in Britain was divided into two parts. The first meeting was held in London and the second in Edinburgh. In the latter city the surgeons had an opportunity to see a remarkable demonstration of models showing the various procedures adopted in plastic surgery and maxillofacial surgery. All these models were made in the dental laboratory at the Plastic and Jaw Injury Unit at Bangour Hospital near Edinburgh. The construction of teaching models has been a feature of this unit even during the war days. The unit is directed by A. B. Wallace, with T. Rankin in charge of dental surgery. Mr. Wallace is the editor of the new *British Journal of Plastic Surgery*, which is to be published for the first time early this year.—*John Boyes, University of Durham, Newcastle Upon Tyne, England.*

A. D. A. AFFAIRS

A.D.A. BOARD OF TRUSTEES MEETS THIS MONTH

The Board of Trustees of the American Dental Association will hold its regular midwinter meeting February 5 to 8 in the central office, Chicago, to transact the routine business of the Association.

A report of the actions of the Board will be published in an early issue of THE JOURNAL.

CONSTITUTION AND BYLAWS COMMITTEE TO MEET IN CHICAGO

The Committee on Constitution and Administrative Bylaws will meet beginning February 5 in the central office, Chicago, for further consideration of the proposed new constitution and bylaws to be presented to the House of Delegates at the next meeting of the American Dental Association, September 13 to 17, in Chicago.

A report of the committee's deliberations will be published in a later issue of THE JOURNAL.

FIRST DIRECTORY SUPPLEMENT IS READY FOR DISTRIBUTION

The first supplementary correction service of the *American Dental Directory* recently was distributed to subscribers. Appearing in four sections, the supplement contains approximately 12,000 changes and additions in the listings. The name of the dentist, the page number where the listing now may be found in the *American Dental Directory* and the correction are given.

The supplementary monthly service is available on a subscription basis to those interested in keeping an up-to-date record of all dentists in the United States and its territories.

For information regarding the terms of the subscription write to John J. Hollister, Business Manager, American Dental Association, 222 E. Superior St., Chicago 11.

A.D.A. RELEASES ADVERTISING AND EXHIBIT STANDARDS

For the purpose of determining eligibility of products and services for sales promotion through official media of the American Dental Association, a set of standards for advertising and exhibits has been adopted.

In brief, any product or exhibit will be accepted for advertising or exhibit provided that:

(a) it is relevant to dentistry;

(b) it does not contain any substance that is demonstrably harmful or which can be shown to be potentially harmful by substantial scientific evidence;

(c) there are no claims presented which have been the subject of unfavorable decision, or which are presently the subject of formal complaint by the Federal Trade Commission;

(d) any claims made in lay and professional publications and exhibits are consistent with those presented in media of the American Dental Association;

(e) the advertising and sales promotion conform to those policies of the Association which relate to the maintenance of professional standards and the employment of equitable methods of sales promotion.

MILITARY AFFAIRS COMMITTEE TO MEET ON FEBRUARY 8

There will be an open meeting of the Committee on Military Affairs of the American Dental Association on February 8 in the Stevens Hotel. The chair-

men of all state military affairs committees and dentists who served in World War II are invited to attend this meeting.

Robert T. Curren of Springfield, Ill., is chairman of the Committee on Military Affairs.

JACOB M. WISAN APPOINTED TO ASSOCIATION STAFF POSITION

J. M. Wisan of Elizabeth, N. J., has been appointed director of the Division of Dental Health Education of the American Dental Association, effective January 5.

Dr. Wisan was born in Staten Island, N. Y., on February 28, 1896, and was educated at the Curtis High School and City College of New York. In 1918, he was graduated from the College of Dentistry, New York University, after which time he practiced dentistry in Staten Island until 1923. Since 1923, Dr. Wisan has been practicing his profession in Elizabeth, N. J.

Between 1930 and 1937, Dr. Wisan served as chairman of the Union County (N. J.) Oral Hygiene Committee and as chairman of the New Jersey State Council on Mouth Hygiene and Public Instruction. Through his work on this council, a great degree of cooperation and close rapport was achieved between the New Jersey State Dental Society and the State Department of Education. While chairman of the Council, he developed accredited courses in dental health education for the New Jersey state teachers' colleges.

In 1939, Dr. Wisan was appointed consultant on the dental program of the New Jersey State Department of Health. Later he was promoted to chief of the Division of Dental Health. Dr. Wisan was responsible for the organization of dental health committees on state, county and local levels, which stimulated lay participation in dental health programs throughout New Jersey.

Jacob M. Wisan, newly appointed director of the Division of Dental Health Education of the American Dental Association

He has been a representative of the American Dental Association as a member of the national committee to revise school health policies, president of the American Society of Dentistry for Children and lecturer on dental health education in Seton Hall College, New York University, and New Jersey state teachers' colleges. Dr. Wisan is the co-editor of the book, *Dentistry in Public Health*, soon to be published by the American Public Health Association.

For more than sixteen years, Dr. Wisan has proved himself capable of conducting dental health educational programs in New Jersey. The knowledge he has achieved from these programs qualifies him for this new position with the Association.

KREMER IS NAMED CHAIRMAN OF LOCAL ARRANGEMENTS COMMITTEE

Leo W. Kremer, Chicago, recently was named chairman of the Committee on Local Arrangements for the 1948 an-

nual meeting of the American Dental Association. Dr. Kremer was nominated by the Illinois State Dental Society for this position because of his wide experience in the handling of midwinter meetings for the Chicago Dental Society. He was active also in staging the annual meeting that was held in Chicago during the World's Fair of 1933.

The personnel of the local committees will be announced by the Board of Trustees after its February 1948 meeting.

A.D.A. MEMBERSHIP FIGURES FOR NOVEMBER 1947 ANNOUNCED

The total membership of the American Dental Association as of November 30, 1947, is 68,775. The membership reads:

Regular members (states, territories, Public Health Service and Veterans Administration)	65,935
Undergraduate members (colleges and universities)	1,955
Life members	885
Total members	68,775

New York, Illinois and Pennsylvania lead the states in total membership with 10,385, 5,442 and 5,065 members, respectively.

ASK DENTISTS TO CONTINUE CONTRIBUTIONS TO RELIEF FUND

The office of the business manager of the American Dental Association recently announced that the amount of $10,011 has been deposited so far from the sale of Christmas seals for the benefit of the relief fund for destitute dentists.

As the relief fund is maintained only through the sale of these seals, the American Dental Association, sole distributor of the seals, asks dentists to cooperate in this project to aid needy dentists.

CATALOG IN DENTAL HEALTH EDUCATION IS AVAILABLE

A new catalog of dental health education material distributed by the American Dental Association is available now. The catalog has been designed especially for convenient use in choosing the information and material needed and in making it possible for the central office of the Association to provide the most efficient service.

The materials have been divided under the following headings: school dental health programs, materials for general distribution, professional materials, library service and visual aids.

The catalog is supplied, without charge, to all persons interested in dental health education.

TOTAL OF DENTAL GRADUATES IS ANNOUNCED BY COUNCIL

According to the Council on Dental Education of the American Dental Association the total number of graduates of dental schools in the United States for the year ending June 30, 1947 was 2,225.

Of this total, 1,145 had two years of predental college training; 407 had three years; 551 had bachelor's degrees; 66 had four years without degrees, and 56 had other than bachelor's degrees.

DENTAL SOCIETIES

CHICAGO MEETING WILL FEATURE LIMITED ATTENDANCE CLINICS

The Chicago Dental Society will hold its 1948 midwinter meeting at the Stevens Hotel, February 9 to 12. The limited attendance clinics, so popular in 1947, have been expanded this year in order to allow more dentists an opportunity to attend the clinics of their choice.

Distinguished clinicians will present programs at these limited attendance

clinics that should prove informative to practicing dentists. Subjects such as crown and bridge prosthesis, operative technic for the child patient and surgical removal of impacted teeth lend themselves ideally to this method of presentation.

The price of attendance at each clinic is $2, and this amount should be enclosed with each request.

CONNECTICUT ASSOCIATION TO SPONSOR COURSES THIS SPRING

The Committee on Post Graduate and Research of the Connecticut State Dental Association is planning a course in minor oral surgery, anesthesia and oral diagnosis to be presented by Sterling V. Mead and Daniel Lynch, both of Washington, D. C., in the spring of 1948 at New Haven.

A course in prosthetics to be given in the city of Waterbury also is being planned.

CASSEL ELECTED SECRETARY OF MINNESOTA DENTAL GROUP

Carl V. E. Cassel of Duluth, Minn., has been elected to fill the vacancy left by Louis M. Cruttenden, former secretary of the Minnesota State Dental Association, when Dr. Cruttenden accepted the position of assistant secretary of the American Dental Association. Dr. Cassel, who at the time of election as secretary was president-elect of the Minnesota State Dental Association, resigned from this position.

Dr. Cassel received his B.A. degree at Gustavus Adolphus College, St. Peter, Minn., in 1913, and his D.D.S. degree at the School of Dentistry, University of Minnesota, Minneapolis, in 1922.

He is a past president of the Duluth District Dental Society and has served on the Board of Trustees of the Minnesota State Dental Association.

Ray Cummings (left), representative of the Ohio State chapter of Omicron Kappa Upsilon, presenting an honorary key and membership in the fraternity to Ohio Congressman Walter Brehm, a dentist and a member of the Ohio State Dental Society

CINCINNATI MAKES PLANS FOR ANNUAL MARCH CLINIC

The Cincinnati Dental Society will hold its annual March clinic and Children's Dental Health Day program for three days beginning March 14 at the Hotel Netherland Plaza. This annual meeting serves a district that includes dentists from other cities in southern Ohio as well as from Kentucky, Indiana and West Virginia.

The Cincinnati Dental Society is sponsoring a new feature in dental conventions in that research directors of some of the leading dental drug and manufacturing companies will present noncommercial scientific clinics with motion pictures. Refresher courses in fixed bridgework, prosthetics, and psychology in handling patients and dental economics will be offered.

The Children's Dental Health Day program on March 14 will feature the announcement of the winner of the annual dental health poster contest and discussions on children's dental health. This part of the program is sponsored by the Dental Division of the State Board of Health and the Public Dental Service Society in cooperation with the Cincinnati Dental Society.

Carlos Schott, installing the new officers of the Ohio State Dental Society at the recent annual meeting in Cleveland: left to right, Roy C. Harkrader, vice-president; Walter Sargent, president-elect; Wendle Postle, dean of the College of Dentistry, The Ohio State University; Dr. Schott, and Earl G. Jones, secretary and treasurer

GREATER NEW YORK MEETING RECEIVES LARGE ATTENDANCE

Willard S. Bell, chairman of the Organization Committee for the 1947 Greater New York Dental Meeting, recently issued the statement that there was a total registration of 14,454 dentists during the five day meeting held at the Hotels Pennsylvania and New Yorker on December 8 to 12.

The Greater New York Dental Meeting was held under the auspices of the First and Second District Dental Societies.

SEVERAL DISTRICT DENTAL SOCIETIES PLAN MEETINGS

District of Columbia.—The District of Columbia Dental Society will present a postgraduate clinic on March 14, 15, 16, 17 and 18 at the Shoreham Hotel in Washington, D. C. Topic discussions, table clinics, visual education demonstrations and commercial exhibits have been planned for the program by the clinic committee.

Ohio.—The Cleveland Dental Society announces that the Eighth Annual Children's Dental Health Day will be held on February 2 at the Hotel Statler in Cleveland. Limited attendance clinics, educational exhibits, a professional session and a layman's session have been planned.

Pennsylvania.—The Greater Philadelphia Annual Meeting will be held in the Bellevue-Stratford Hotel in Philadelphia on February 4, 5 and 6. More than twenty of the best known essayists in the country and more than forty well known clinicians will participate in this meeting.

INTERNATIONAL

U.S. AND GREAT BRITAIN FORM SCIENTIFIC MISSION IN LONDON

To direct and facilitate the exchange of scientific information and personnel between the United States and Great Britain, a scientific mission is to be established in the United States Embassy in London. Activities covered by this mission will be in the fields of organic chemistry, biochemistry, physics, biology and agronomy.

Professor Earl A. Evans, Jr., formerly professor and chairman of the Department of Biochemistry at the University of Chicago, will head the staff of scientific men and engineers at the mission.

NEW SOUTH WALES ESTABLISHES DIVISION OF DENTAL SERVICES

The Department of Health in New South Wales recently announced the establishment of a Division of Dental Services and the appointment of Leslie Pudney as director of this division, as a means of embracing all public dental services in state institutions under one directorial head.

With this important step, the director of the Division of Dental Services will be in a position to coordinate all state dental services in such a way as to provide adequate dental care to those pa-

tients who are unable to receive treatment owing to a lack of facilities to travel to large centers or some physical disability.

F.D.I. TO ISSUE CARDS TO U.S. MEMBERS FOR 1947-1948

Oren A. Oliver, Nashville, Tenn., chairman of the special committee of the American Dental Association to secure members in the Fédération Dentaire Internationale, recently announced that the membership drive had been completed with the addition of more than a thousand dentists to the international membership rolls. Memberships were solicited for two years, and membership cards for the year 1947-1948 will be in the mails during January and February.

It is anticipated that the F.D.I. will issue bulletins to members as soon as facilities are available.

NEW ZEALAND DENTAL CORPS ACCORDED HIGH HONOR

In recognition of the value of the services rendered by the New Zealand Dental Corps during both world wars, the title "Royal" has been bestowed on the New Zealand Army Dental Corps by England's King George VI.

This is the highest honor that can be given to the officers and other men of a professional corps in the Dominion's forces.

SCIENTIFIC, TECHNICAL BOOKS ARE REQUESTED BY FINLAND

Because its library was bombed and destroyed during the war, Finland's technical institute, Teknillinen Korkeakoulu, through its director, Dr. Martti Levon, is requesting gifts of scientific and technical books and periodicals from the United States.

These books and periodicals should be marked for the Institute of Technology, Helsinki, and sent to the Legation of Finland, 2144 Wyoming Ave., N.W., Washington, D. C., from where they will be shipped to Finland.

DENTAL EDUCATION

OFFER REFRESHER COURSES FOR DENTISTS AT U. OF ILLINOIS

Several refresher courses will be offered by the College of Dentistry, University of Illinois during the months of February and March. Starting February 2 for one week, John M. Spence, acting head of the department of operative dentistry, will teach "Operative Dentistry." Elsie Gerlach will present a one week course in "Dentistry for Children," beginning on February 16. "Oral Pathology, Diagnosis and Surgery," a two week course starting February 23, will be presented by Herbert P. Steinmeyer, assistant professor of oral pathology, and Bernard G. Sarnat, acting head of the department of oral and maxillofacial surgery.

A two week course in "Root Canal Surgery and Periodontia," will be given by Robert G. Kesel, head of the department of applied materia medica and therapeutics, beginning on March 8. The final course, "Crown and Bridge," presented by Stanley D. Tylman, head of the crown and bridge department, will start on March 22 and will be of two weeks' duration.

In January, W. H. Kubacki, professor of prosthetic dentistry, presented a three week course in "Complete Dentures" and a one week course in "Partial Dentures."

Registration in each course is limited to six dentists. For further information on any of the courses offered in February and March, write to Dr. Isaac Schour, associate dean of the College of Dentistry, University of Illinois, 1819 W. Polk Street, Chicago 12.

The new four story home of the School of Dentistry, Temple University, located on Broad Street above Allegheny Avenue in Philadelphia

TWO DAY PROGRAM WILL OPEN NEW TEMPLE U. DENTAL SCHOOL

The new $1,500,000 home of the School of Dentistry, Temple University, will be opened formally on April 15 and 16 in a two day program featuring scientific sessions, headed by several outstanding clinicians. There also will be a dinner at which the address will be given by an internationally known speaker outside the field of dentistry, a convocation for the conferring of honorary degrees and an open house to allow alumni and visitors to view any department of the school. H. B. Washburn, president of the American Dental Association, will be a speaker at the dinner, along with other leaders in the profession.

Among the new school's facilities are: thirteen laboratories, twelve seminar rooms, five lecture rooms seating 125 each, clinics with a hundred stations for adults and twenty-five for children (including eight clinics for oral surgery and thirty-four for oral hygiene), an auditorium seating more than 800, a 40,000 volume library and three dental supply house storerooms.

The School of Dentistry is located one block from the medical school, hospital and nurses' home and is part of the university's plan for a complete health center in Philadelphia.

U. OF MICHIGAN OFFERS NEW DENTAL HYGIENE CURRICULUM

The School of Dentistry, University of Michigan, Ann Arbor, recently was authorized to offer a four year curriculum in dental hygiene leading to the degree of bachelor of science in dental hygiene.

The curriculum will consist of two years or sixty hours of credit in the College of Literature, Science and the Arts or in another college of equivalent stand-

ing, provided that the curriculum of study and the grades earned have been such that they would admit the candidate to a course of study leading to a degree in the College of Literature, Science and the Arts, and a two year course in dental hygiene which will be the same as that now offered, with the additional nine hours to be specified.

Subject, not hour, credit will be allowed in the dental hygiene curriculum for equivalent courses taken in the College of Literature, Science and the Arts. Such advanced credits must be replaced by electives to a grand total of sixty-one credit hours. These electives may be chosen from courses given in the College of Literature, Science and the Arts, and the Schools of Education and Public Health, with the approval of the director of the curriculum.

The four year curriculum will not supersede or in any way alter the present two year program of training for which a certificate in dental hygiene is awarded.

CONGRESS ON DENTAL EDUCATION IS SCHEDULED THIS MONTH

The Fourth Congress on Dental Education and Licensure will be held in Chicago on February 7 at the Stevens Hotel. Wilbert Jackson of Clinton, N. C., chairman of the Council on Dental Education, will preside at the meeting. The morning session will be devoted entirely to consideration of the mutual problems of teaching and examining in dentistry. Papers will be presented by W. A. Wilson, secretary of the State Board of Registration and Examination in Dentistry in New Jersey, and by Walter H. Wright, dean of the College of Dentistry of New York University.

The afternoon session will be devoted to consideration of the specialties in dentistry and will be conducted by the Advisory Board for Dental Specialties. John C. Brauer, president of the board, will act as moderator of a round table discussion, which will have as participants, Howard C. Miller for oral surgery, Harold J. Leonard for periodontia, Bernard G. DeVries for orthodontics, Kenneth A. Easlick for pedodontics and Irving R. Hardy for prosthodontia.

Dental school teachers and administrators and members of state and national examining boards are invited to attend both sessions. Dentists attending the midwinter meeting of the Chicago Dental Society are especially welcomed.

The committee in charge of the congress consists of J. R. Blayney, chairman, Robert W. McNulty and C. E. Chamberlain.

ARMY AND NAVY

HAWLEY SELECTED TO STUDY MEDICAL WORK OF ARMY, NAVY

Paul R. Hawley, organizer of the medical service of the Veterans Administration under Gen. Omar Bradley, has been invited by Defense Secretary Forrestal to recommend plans for the coordination of medical services of the Army, Navy and Air Force.

Dr. Hawley recently announced his resignation from the Veterans Administration effective December 31, at which time he also was retired from the Army Medical Corps.

CONSULTANTS IN DENTAL AND ORAL PATHOLOGY APPOINTED

Kurt H. Thoma of Boston and Lester R. Cahn of New York recently have been appointed to serve as special resident consultants in dental and oral pathology to the Surgeon General, Department of the Army, on the staff of the Army Institute of Pathology as a part of the postwar activities of the Army Dental Corps. Their appointments are for one year during which time both Dr.

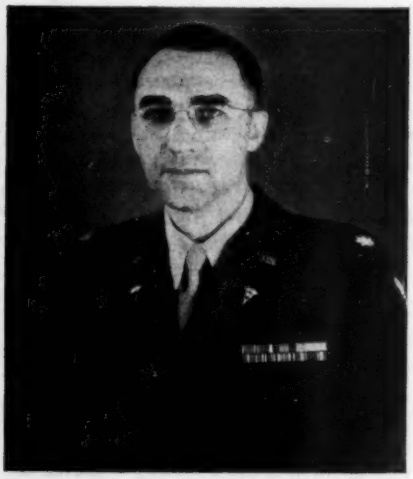
Thoma and Dr. Cahn will work on specific research problems at the Army Institute of Pathology with Lt. Col. Joseph L. Bernier, chief of the dental and oral pathology section of the institute.

The following have been reappointed as consultants to the Registry of Dental and Oral Pathology of the American Dental Association by Henry A. Swanson, chairman of the Committee on National Museum and Dental Registry of the American Dental Association, and Lt. Col. Joseph L. Bernier, secretary: Paul E. Boyle, Lester R. Cahn, Donald A. Kerr, Hamilton B. G. Robinson, Kurt Thoma and Henry Goldman.

The appointments are made for a two year period. From time to time, these consultants will be forwarded interesting cases for comment.

LT. COL. REUTER APPOINTED AIR FORCE DENTAL HISTORIAN

Lt. Col. Walter J. Reuter, Arlington, Va., has been appointed Air Force dental historian for World War II by Gen. Carl Spaatz, Air Force Chief of Staff.



Lt. Col. Walter J. Reuter, recently appointed Air Force dental historian for World War II

Dr. Reuter will continue to hold his present position as chief dental surgeon of the Bolling Field Command, Washington, D. C., but he will devote six months of the year to historical research at Air Surgeon headquarters in preparing his report on the dental activities of the Army Air Force in World War II.

WAR DEPARTMENT RELEASES STATEMENT ON REGULAR ARMY

The following is a statement by the War Department regarding appointments in the Medical and Dental Corps, Regular Army:

The following plan has been submitted by the Surgeon General for the approval of the Department of the Army. Male graduates of acceptable medical or dental schools who are citizens of the United States shall be eligible for commission in the Medical or Dental Corps, Regular Army. . . . Applicants will fall into one of two groups: (1) those on active duty holding commissions in the medical or dental sections of the Officers' Reserve Corps, National Guard of the United States or Army of the United States, who have demonstrated their capability by having performed no less than six months of continuous active duty, and (2) those civilian physicians or dentists who are professionally qualified and possess the necessary qualifications for specific positions which are determined by the Surgeon General.

With regard to group 1, the War Department stated that appointments "will be made under authority contained under Public Law 381, 80th Congress" and that "maximum age may be waived for personnel who served on active duty in World War II." In group 2, appointments "will be made under authority contained under Title II, Public Law 365, 80th Congress."

The statement of the War Department continues as follows:

An officer who is on active duty at the time of appointment and is holding a temporary commission in a higher grade than that to which appointed, or who is not on active duty but held a higher grade prior to report-

ing to a separation center, will retain or be recalled to active duty in the higher grade held until reduced in the general reduction program of temporary grades for other Regular officers. Those who are selected from the second group may be initially appointed in the grade in which they meet the requirements of age and active professional practice excluding internships, and including residencies and postgraduate training. . . .

Appointment in the grade of colonel will be reserved for those individuals who possess outstanding qualifications for special positions determined by the Surgeon General as requirements necessitate.

Applicants on active duty will submit applications through command channels. Civilians will submit their applications, accompanied by certificates based on personal acquaintance from at least three reputable persons as to citizenship, character and habits, and, in addition, such evidence of professional attainment as will sustain consideration for commission in the grades higher than first lieutenant, direct to the Adjutant General. Applicants for appointment as first lieutenant will furnish a transcript of their scholastic record in medical or dental school together with a statement from the school as to their relative standing in their class on graduation. Screening centers for interviewing applicants are established at all Army general hospitals in the zone of the interior. Each candidate will receive a complete physical examination which will conform in all respects to the standards for officers of the Regular Army.

WAR DENTAL SERVICE IS SURVEYED IN MEDICAL MAGAZINE

The November 1947 edition of *The Military Surgeon*, official publication of the Association Military Surgeons of the United States, is a special dental issue dedicated to the work accomplished by Army dentists in World War II, including a survey of the Army Dental Corps during the past forty-six years.

Among the representative articles in this issue are a survey of pathologic specimens from the oral regions seen at the Army Institute of Pathology during World War II; reports concerning dental service in the postwar army, the Veterans Administration, the United States Air Forces and the European Command; notes on dental supplies and equipment during the war, and discussions with regard to dental service in hospitals, the theater of operations and the Selective Service System.

ARMY DENTAL OFFICERS TO STUDY AT TUFTS COLLEGE

Beginning on or about February 2 two courses of postgraduate instruction in periodontology and denture prosthesis will be conducted by the Graduate Division, Tufts College Dental School, Boston, for Army Dental Corps officers. Officers will be eligible for one of the courses only. The courses are both for a sixteen week period. A quota of five dental officers has been established for the course in periodontology, and a quota of two dental officers has been set for the course in denture prosthesis.

DENTAL RESEARCH PROJECTS RECEIVE SUPPORT FROM NAVY

The Office of Naval Research has underway or in the contract-preparation stage eleven projects at the following universities: Cornell, Chicago, Pennsylvania, Michigan, Columbia, Tufts (2), Georgetown (2), Western Reserve and Massachusetts State College.

These investigations, plus those sponsored independently by dental schools, the American Dental Association and other organizations, are said by experts to be altogether too few in comparison with the need for intensive study of caries and other problems. However, at the present time the Committee on Legislation is endeavoring to secure an early hearing by the House Committee on Interstate and Foreign Commerce in an effort to pass the National Institute of Dental Research Bill (S.176) which

would create funds for the sponsoring of numerous research projects.

TWO DENTAL OFFICERS ARE NOMINATED TO REGULAR ARMY

President Truman recently announced the nominations of Brig. Gen. Thomas L. Smith to Major General, Regular Army, and Col. Walter D. Love to Brigadier General, Regular Army, under the provisions of the new law passed by Congress last year concerning the transfer of reserve and temporary officers to the corresponding regular service.

Confirmation of these nominations by the United States Senate, without hearings, was to have been effected within sixty days after the announcement early in December.

FEDERAL AGENCIES

DEMAND FOR MOTION PICTURE ON SILICATE CEMENT IS HIGH

The demand for the National Bureau of Standards' motion picture on silicate cement, produced with the cooperation of the American Dental Association, has been so great that additional copies have been printed to meet the unusual demand from the dental profession.

As of December 1, forty-five loans were made, and more than a hundred requests for future showings were filed with the Bureau. The Research Commission and the Bureau are putting forth every effort to fill the requests for the film.

Members of the Association are cautioned against announcing a meeting for the showing of this film until arrangements have been made through the Bureau for its delivery on the desired date. Future requests for the use of the film should reach the Bureau at least thirty days in advance of the proposed date of the showing.

PATENTS ISSUED IN NOVEMBER OF INTEREST TO DENTISTS

2,430,177 Leonard E. Johnson and Milton LaGrande
Prosthetic Denture Correlator

2,430,271 Warner Morel Brantley
Tooth Extractor

2,430,525 Roland M. Miller
Combination Guide and Label

2,430,795 Theodore Wichner
Demountable Dental Pin Assembly

2,431,086 Jacob A. Saffir
Artificial Tooth

Re.22,938 Christian Kisky
Toothbrush

2,431,406 Martin Lasersohn
Cartridge Cylinder Unit for Hypodermic Syringes

2,431,521 Julius A. Thiemann
Gum Brace

2,431,533 William F. Hamilton
Stabilized Solutions of Local Anesthetics

2,431,606 George L. Briggs
Toothbrush

PUBLIC HEALTH

APPOINT NEW DIRECTOR TO PUBLIC HEALTH ORGANIZATION

Anna Fillmore, R.N., of New York, has been appointed general director of the National Organization for Public Health Nursing, succeeding Ruth Houlton, R.N.

Miss Fillmore is a graduate of the Dr. Groves Latter Day Saints Hospital School of Nursing, Salt Lake City, and she secured her public health nursing preparation at the University of California, Berkeley. She received a Bachelor of Science degree from Teachers College, Columbia University and the degree of Master of Public Health from Harvard University.

Just prior to her recent appointment, Miss Fillmore was assistant director of the Visiting Nurse Service of New York.

SIXTEEN STATES SUBMIT SICKNESS AND HEALTH BILLS

More than fifty bills were introduced in sixteen state legislatures in 1947, calling for establishment of compulsory systems of sickness benefits or health insurance. Although the bills varied as to administration, benefits, coverage and method of financing, there was considerable similarity in them.

In general, the bills come under six major classifications: (1) cash sickness benefits—monopolistic type, (2) cash sickness benefits—optional type, (3) cash sickness benefits—voluntary type, (4) unemployment sickness benefits, (5) prepayment medical care, and (6) pregnancy benefits.

In bills providing for cash sickness benefits (monopolistic type), the benefits and coverage are identical with unemployment compensation and are financed by payroll taxes. The state sets up a monopolistic fund for the payment of benefits, and affiliation is compulsory. In the second classification, in which affiliation for cash sickness benefits is optional, the benefits and coverage are similar to those in the first classification.

In bills providing for the voluntary type of sickness benefits, the payment of cash sickness benefits is compulsory. However, no state fund is set up, and employers are required to adopt private or voluntary insurance plans subject to state approval and supervision.

Under most existing state laws, unemployment sickness benefits (fourth classification) are payable only to unemployed workers who are physically able and willing to work. Bills of this type call for the continuation of employment benefits to workers who become ill after registering for or receiving such benefits.

In the bills providing for prepayment medical care, which usually cover both workers and dependents, benefits are in the form of medical, surgical, hospital or other services rather than cash. Such service benefits are financed by payroll taxation and a state fund. Provision sometimes is made for cash sickness benefits in addition to services.

In bills covering pregnancy benefits, there is provision for the payment of unemployment benefits to female workers absent from work because of pregnancy.

The states in which bills were submitted are: Alabama, Arizona, California, Connecticut, Illinois, Maryland, Massachusetts, Minnesota, Montana, Nevada, New Hampshire, New Jersey, New York, Pennsylvania, Washington and Wisconsin.

U.S. AID FOR PROFESSIONAL STUDENTS GAINS SUPPORT

The Association of State and Territorial Health Officers recently adopted a resolution calling for federal scholarships in dentistry, nursing and allied fields, as well as in medicine, to remedy the increasing inability of institutions and students to meet the costs of professional training in these fields.

Nationwide promotion of the policy of applying sodium fluoride to children's teeth for the prevention of caries also was recommended by this association.

NEW JERSEY PUBLISHES REPORT ON HEALTH FACILITIES

In order to determine the over-all requirements for additional hospitals and public health centers throughout the state of New Jersey and in compliance with the Federal Hospital Survey and Construction Act, a survey of existing facilities was made recently under the supervision of the New Jersey State Department of Institutions and Agencies.

The results of this survey to date have been published as a source book, *Hospital and Public Health Resources in New Jersey*, Part I. Chapter 9 is devoted to dentistry. According to a recent census, there are 3,317 practicing dentists in New Jersey, or a ratio of 1 dentist per

1,254 population, compared with the national figure of 1 to 1,800.

Dental service in hospitals, other than state hospitals, is as follows: thirty-three hospitals have dental clinics; thirty-nine hospitals do not have dental clinics; twenty-five hospitals have a dentist on call; ten hospitals employ dentists, and nine hospitals have dental interns.

As for school dental programs, 60 per cent of the school districts have a dental care program. These programs were developed by local boards of education and departments of health in cooperation with local and state dental societies. In some areas the State Department of Health through its dental division subsidizes dental care programs for children and provides dental service programs in parochial schools and trailer clinics in rural areas.

Dental services are provided for all adults and children in state institutions.

The New Jersey State Dental Society, through its Council on Dental Health, also participates in a coordinated dental health educational program, with the State Departments of Health and Education and the lay dental health committee.

DENTAL HEALTH PROGRAM IS EFFECTED IN IOWA

In a recent report concerning the Iowa plan for dental health education, a plan organized in 1927 for the promotion of better teeth for Iowa school children, summaries of oral surveys made of high school students, in addition to other data relevant to the plan, were released.

Between 1942 and 1947, oral examinations of 15,386 high school students in sixteen counties revealed that 2,681 were without decayed, missing or filled teeth.

The Bureau of Dental Hygiene, Dental Building, Iowa City, Iowa, will continue to provide at cost the following educational materials to proper school authorities: dental cards, classroom records, and the *Handbook of Dental Health Education for the Elementary Teacher.* Also available for loan are dental health slides and film strips, dental health films, pamphlets, photographic exhibits and slide lectures.

The plan for dental health education is sponsored by the Bureau of Dental Hygiene of the Iowa State Department of Health cooperating with the State University of Iowa.

ILLINOIS SPONSORS DENTAL ROENTGENOGRAMS FOR CHILDREN

Roentgenologic examinations of the teeth were provided, without charge, for 962 elementary school children during the ten days of the Illinois State Fair through the services of the Division of Public Health Dentistry of the State Department of Public Health.

The roentgenograms were mounted and mailed to the parents of each child, with a request that they be taken to the family dentist for interpretation and recommendations as to the necessary dental work for the child.

RESEARCH

APPLETON IS AWARDED 1947 ALFRED C. FONES MEDAL

Joseph L. T. Appleton, Jr., dean of the Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, is the recipient for 1947 of the Alfred C. Fones Medal, for his research work in bacteriology and pathology. This medal is presented each year by the Connecticut State Dental Association to the person who has made the outstanding contribution to dentistry, of either a theoretical or technical nature.

The presentation of the Fones award was made by Robert H. W. Strang of Bridgeport.

WASHINGTON U. RECEIVES GRANT FOR ORAL CANCER RESEARCH

The School of Dentistry, Washington University, St. Louis, recently was awarded $12,015 by the National Cancer Institute of the United States Public Health Service for basic biological research in experimental oral cancer. B. M. Levy is in charge of the research project at Washington University.

Altogether forty-six grants, amounting to nearly $750,000, were made for clinical as well as basic biological research in universities, hospitals and scientific institutes.

GENERAL NEWS

ARNO LUCKHARDT IS HONORED AT TESTIMONIAL DINNER

To celebrate the honor bestowed on Arno Luckhardt by the trustees of the University of Chicago where he recently was appointed to a distinguished service professorship in physiology, a group of Chicago dentists, last November, sponsored a testimonial dinner in order to congratulate Dr. Luckhardt formally on his appointment.

In tribute to his work in furthering medical-dental relations, physicians and dentists, as well as a research chemist and a social scientist, spoke in praise of Dr. Luckhardt at the dinner.

Dr. Luckhardt is equally at home with dental and medical groups, a fact that is borne out by his participation as a member of the research and medical-dental relations committee of the American College of Dentistry and as a member of the Council on Dental Therapeutics of the American Dental Association since its organization in 1930. For forty years, Dr. Luckhardt has been a member of the medical faculty of the University of Chicago as both a teacher in the department of physiology and a leader in scientific research. It was through Dr. Luckhardt's tireless research that ethylene gas was discovered. This discovery laid the foundation for advances in the use and administration of anesthetics, both general and local.

"LOOK" PUBLISHES ARTICLE ON DENTISTRY FOR CHILDREN

The December 9 issue of *Look* devotes three pages to an illustrated story of a young child's first visit to the dentist. The article emphasizes the necessity for an early contact between the child and his dentist so as to assure healthy permanent teeth as well as normal growth and development of the jaw and mouth.

Patience and understanding on the part of the dentist in his relation to the child at the time of the first visit often result in an intelligent and lasting contact. The article illustrates how a brief examination of the dentist's equipment and instruments serves to allay some of the fears the child may have on visiting the dentist for the first time.

Look, in cooperating with the dental profession by publishing an article of this type, is helping to educate the general public and especially the parents of young children in the value of preventive dentistry.

ORAL PATHOLOGISTS TO MEET IN CHICAGO IN FEBRUARY

The American Academy of Oral Pathology will hold its second annual meeting on February 8 at the Hotel Stevens in Chicago. Included among the speakers are: Carl Waldron, School of Dentistry, University of Minnesota; B. O. A. Thomas, School of Dentistry, University of Washington; Edward C. Stafne, The Mayo Clinic; Cmdr. Carl A. Schlack, Naval Medical Research Institute; Hamilton B. G. Robinson, College of Dentistry, The Ohio State University; Barnet M. Levy, School of Dentistry, Washington University; Irving

Glickman, Tufts College Dental School; Henry Goldman, Boston; Lester R. Cahn, School of Dental and Oral Surgery of the Faculty of Medicine, Columbia University; Hermann Becks, College of Dentistry, University of California, and Myron Aisenberg, Baltimore College of Dental Surgery, Dental School, University of Maryland.

The Academy will hold examinations for fellowships in the spring of this year.

DIAGNOSIS AND TREATMENT IS THEME OF CALIFORNIA MEETING

The fortieth annual conference of the University of Southern California College of Dentistry Alumni Association will be held on February 1, 2 and 3 at the Clinic Building, College of Dentistry, in Los Angeles.

The theme of this meeting will be "diagnosis and treatment planning—the foundation for sound dental practice management." The faculty will attempt to answer questions concerning the determining and carrying out of treatments in dentistry. Individual table clinics will be presented for demonstrating technics and procedures in dental diagnosis.

There also will be a demonstration of the hypnosis of patients for operative procedures in the dental office.

ANTIVIVISECTION CHARGE NOT RECOGNIZED BY CHICAGO COURT

Judge U. S. Schwartz of the Superior Court in Chicago recently declared that there will be no trial or testimony on a charge denying the validity of the Arvey Ordinance, which provides that medical institutions in the Chicago area shall receive unclaimed pound dogs.

In a bill of complaint, George T. Harz, president of the antivivisectionist "Voters' 'I Will' Organization," attempted to get a ruling that would prohibit the city of Chicago from carrying out the provisions of the ordinance. When the suit was dismissed from the Superior Court, Harz stated that he would appeal to the Appellate Court. It is expected that the Apellate Court will uphold the order.

OHIO STATE UNIVERSITY ISSUES NEW SCIENTIFIC JOURNAL

The first issue of *The Health Center Journal,* a new scientific periodical published by the faculties of the Colleges of Medicine and Dentistry of Ohio State University, was distributed December 1.

Scientific papers by members of the medical and dental faculties, reviews and comments on recent medical and dental articles, messages from the deans, proceedings of the Society for Clinical Research and a book review section are included in the journal.

MID-CONTINENT DENTAL CONGRESS HELD IN ST. LOUIS IN DECEMBER

Approximately 1,500 dentists were present at the meeting of the Seventh Mid-Continent Dental Congress in St. Louis on December 1, 2 and 3.

The meeting consisted of general scientific sessions, limited attendance clinics, a question and answer program conducted by distinguished essayists, and special lecture clinics. H. B. Washburn, president, and Harold Hillenbrand, secretary, both of the American Dental Association, were present at the meeting.

NATIONAL DENTAL VETERANS TO ELECT OFFICERS AT CHICAGO

The National Dental Veterans' League will meet during the annual midwinter meeting of the Chicago Dental Society in Room 12 of the Stevens Hotel on Tuesday, February 10 at 8 p. m.

The election of officers to the League is on the agenda of the business portion of this meeting.

REPORTS OF

COUNCILS AND COMMITTEES

COUNCIL ON DENTAL HEALTH

THE NATIONAL CONFERENCE ON LOCAL HEALTH UNITS

The American Public Health Association conducted a national conference on local health units at Princeton University, September 9 and 10, 1947. Approximately 100 delegates represented 65 national citizen and health agencies. Leon R. Kramer, Topeka, Kan., represented the American Dental Association at the request of the Council on Dental Health.

The main purpose of the conference was to consider minimum standards of local health services for the population of the United States. It was agreed during the two day meeting that the local health department should provide at least the following services:

1. Collect data on births, deaths and sickness and make them available for use in planning community health programs, school services, industrial health services and facilities for hospital and medical care.

2. Carry out all activities necessary for the control of communicable and preventable diseases such as tuberculosis, venereal diseases, malaria, hookworm disease and the communicable diseases of childhood.

3. Assist in maintaining the health of mothers and children by finding the remediable defects of sight, hearing, teeth, nutrition and posture and providing for their correction either directly or through existing community facilities.

4. Supervise the physical surroundings of the community and coordinate the activities necessary for providing clean water, milk and food; healthful housing and working conditions; proper sewage disposal, and sanitary recreation facilities.

5. Provide public health laboratory services to aid in diagnosing and treating diseases that are prevalent in the community.

6. Carry on public health education, making known to the people generally the facts of modern biology and science and giving instruction in the use of such facts for the promotion of health.

In summarizing the results of the conference, the participants agreed that "with all of the professional societies vigorously committed to the principle that no person and no area of the United States should be without at least minimum health protection, the job is now up to Mr. and Mrs. Citizen in their various roles as parent, teacher, club worker, labor union member, grange and farm cooperator, business man and board member of voluntary agencies—in short, in their roles as interested, intelligent, informed, crusading citizens."

It was suggested that the first step in securing community support should be the creation of community health councils made up of representatives of all civic and voluntary health organizations, especially medical and dental societies. *—Allen O. Gruebbel, D.D.S., Executive Secretary.*

THE ROLE OF THE DENTIST IN THE DETECTION AND CONTROL OF TUBERCULOSIS

THE paucity of scientific articles on the role of the dentist in the detection and control of tuberculosis is indicative of the fact that this subject has been neglected in dental literature. In order that practicing dentists may have essential information on this subject readily available, the Council on Dental Health requested the preparation of a synopsis by the School of Dentistry, University of Michigan. Authorities who assisted in the preparation of the statement included Kenneth A. Easlick, professor of dentistry (operative), with the advice of Mary C. Crowley, assistant professor of dentistry (bacteriology), Donald A. Kerr, assistant professor of dentistry (histopathology), and John W. Kemper, professor of dentistry (oral surgery). Consultants from the staff of the School of Medicine, University of Michigan, were Daniel E. Jenkins, assistant professor of internal medicine and Arthur C. Curtis, professor of dermatology and syphilology. Lester W. Burket, professor of oral medicine, and J. L. T. Appleton, professor of bacteriopathology and dean of the faculty of dentistry, both of the University of Pennsylvania, also acted as consultants.

John B. Barnwell, William D. Lanier and Arnold Shamaskin of the Veterans Administration have read the statement and submitted suggestions and criticisms. —*Allen O. Gruebbel, D.D.S., Executive Secretary.*

The question has arisen, "What contribution can the dentist make to the detection and treatment of persons with tuberculosis?" In order to reply to this question the literature on the oral aspects of tuberculosis has been explored and the opinions of experienced dentists and physicians have been solicited.

The meager reports of research and the much more ample reports of clinical observations appear to justify certain conclusions:

1. The evidence indicates that tuberculous oral lesions are observed infrequently and usually are secondary to advanced pulmonary tuberculosis.

2. The tuberculous oral lesions manifest themselves as (1) fissures or ulcers, (2) the tuberculoma, (3) periapical granulomas and (4) abscesses of the jaw bone.

3. The most frequently reported lesions are ulcers of the tongue, the labial or buccal mucosa and the oral commissures.

4. The method of inoculation of the mouth has been the subject of considerable debate.

Arguments for the theory of circulatory transmission of the bacilli are as follows:

a. The motions of the jaws, cheeks and teeth, the washing action of the saliva, the bacteriostatic action of the saliva on the tubercle bacillus, the presence of other oral bacteria and the nature of the tissues (stratified epithelium and striated muscle, for example, exhibit a strong resistance to invasion) all have been cited as mechanisms which justify the conclusion that most oral lesions are inoculated hematogenously or lymphogenously.

b. The infrequency of bone involvement as a result of the traumatizing of the oral tissues by tooth extractions and

other forms of oral surgical operations that are performed in the mouths of tuberculous patients whose saliva frequently contains large numbers of tubercle bacilli has been cited as evidence that oral lesions usually are produced secondarily to pulmonary tuberculosis but are inoculated by a circulatory route.

Indications that the oral lesions are inoculated by tubercle bacilli from the sputum are:

a. The location of ulcers along the borders of the tongue and on the oral mucosa approximating the broken-down, sharp edges of teeth has been cited as evidence that traumatized regions of the tongue and buccal mucosa may be inoculated by bacteria from the sputum.

b. Since the lesions of the oral mucous membrane almost always are associated with pulmonary tuberculosis and cavitation, this association has been cited as evidence that the oral lesions develop from direct contact with tubercle bacilli.

5. Reports submitted since 1940 lead to skepticism regarding the opinion that cavities in the teeth serve as portals of entry for the tubercle bacilli, although it is possible to inoculate the dental pulp in experimental animals.

6. Acid-fast organisms have been demonstrated in periapical granulomas, and the conclusion has been reached that inoculation by tubercle bacilli occurs hematogenously. It is difficult to decide from studies of extracted teeth whether the acid-fast organisms present are tubercle bacilli or represent contamination by other oral acid-fast organisms during the extraction. Accurate diagnoses, however, have been made on the basis of changes in the granulomatous tissue removed.

7. Careful oral examinations of large numbers of tuberculous patients indicate that periodontal lesions, including those of Vincent's infection, are no more prevalent in tuberculous than in nontuberculous persons.

8. Oral lesions (ulcers of the tongue and oral mucosa) occur, as a rule, in far advanced pulmonary tuberculosis. In rare instances, they may be the first symptoms to be recognized by the patient as requiring dental or medical advice.

9. The dentist should be alert to recognize tuberculous oral lesions by taking a careful history of the patient and by making use of laboratory facilities to confirm his suspicions. It is well to bear in mind, too, that the symptoms of pulmonary tuberculosis (fever, fatigue, loss of weight, cough, streaked sputum, chest pain) frequently will accompany the oral lesion. Clinical and biopsy material may be sent to a laboratory for bacteriologic tests or for pathologic study.

10. When a tuberculous oral lesion is diagnosed, the dentist should make a tactful referral of the patient to a physician, submitting a laboratory report to the physician selected.

11. The dentist should recognize the danger of contracting infection from a tuberculous patient and the possibility of transmitting the infection from one patient to another. When the presence of tuberculosis is known or suspected, he should exercise proper precautions against the spread of the disease by wearing a mask in addition to making his usual careful efforts to maintain office asepsis.

12. The treatment of oral lesions usually is secondary to steps taken for the general management of this disease. The general treatment should be accompanied by the correction of irritating teeth and broken dentures or other appliances in the mouth. The local treatment may include the use of sedative mouthwashes, the coating of ulcers with bland pastes and the institution of good oral hygiene. Fitzgerald and Banyai[1] reported the successful treatment of ulcers with a preparation containing cod-liver oil, Berberich[2]

1. Fitzgerald, R. J., and Banyai, A. L., New Treatment of Oral Tuberculosis. *J.A.D.A.* 27:1647 (October) 1940.

2. Berberich, Joseph, Treatment of Tuberculosis of the Oral Cavity by Carbon Dioxide Snow. *Am. Rev. Tuberc.* 47:291 (March) 1943.

with carbon dioxide snow and Brodsky[3] with grenz ray irradiation. The use of galvanic and drug cautery has been suggested by others as treatment. Such general treatment of the patient as insistence on adequate rest and diet, frequently accompanied by thoracic surgical operation, likewise is beneficial in the management of oral lesions. Since in a few instances intramuscular injections of streptomycin have produced a marked improvement in the lesions of patients with severe tuberculosis of the pharynx and tonsillar fauces, the possibility exists that a simple adequate treatment of oral lesions will become available.

13. Since adequate nutrition is accepted as an important factor in the treatment of the tuberculous patient, it seems reasonable to conclude that an efficient masticatory apparatus should be established and maintained, provided the length of dental appointments is adjusted to avoid fatiguing the patient.

14. Since the body defenses of the tuberculous patient should be engaged actively in combating the disease, it seems reasonable to recommend the eradication of all oral infections.

15. Inasmuch as there appears to be a wide variation in the dental services now provided by tuberculosis sanatoriums, it appears reasonable to recommend an emphasis on both the quantity and the quality of dental services to be provided in the future.

For those persons who might be interested in studying this problem in more detail, a supplemental list of references is provided.[4-29]

3. **Brodsky**, R. H., Oral Tuberculous Lesions. *Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.)* **28**:150 (March) 1942.

4. Appleton, J. L. T., *Bacterial Infection with Special Reference to Dental Practice*. Philadelphia: Lea and Febiger, 1944, pp. 469-472.

5. Banyai, A. L., and Fitzgerald, R. J., The Treatment of Oral Tuberculosis. *Urol. & Cutan. Rev.* 47:299 (May) 1943.

6. Brodsky, R. H., and Klatell, J. S., The Tuberculous Dental Periapical Granuloma. *Am. J. Orthodont. & Oral Surg. (Oral Surg. Sect.)* 29:498 (September) 1943.

7. Burket, L. W., *Oral Medicine*. Philadelphia: J. B. Lippincott Company, 1946. pp. 492-497.

8. Collins, L. H., Jr., and Cook, T. J., Oral Tuberculosis as the Initial Manifestation of Rapidly Progressing Fatal Tuberculosis. *J.A.D.A.* 27:1608 (October) 1940.

9. Darlington, C. C., and Salman, Irving, Oral Tuberculosis Lesions. *Am. Rev. Tuberc.* 35:147 (February) 1937.

10. D'Aunoy, Rigney; von Haam, Emmerich, and Connell, John, Tuberculosis of the Tongue. *Am. Rev. Tuberc.* 35:180 (February) 1937.

11. Davidson, J. B., and Roberts, E. P., Tuberculosis of the Mouth. *Ann. Den.* 2:103 (December) 1943.

12. Finney, J. M. T., and Finney, J. M. T., Jr., Tuberculosis of the Tongue. *Surg., Gynec. & Obst.* 40:743 (June) 1925.

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OCCUPATIONAL HAZARDS IN DENTAL PRACTICE: QUESTIONS AND ANSWERS

THIS is the first of a series of questions and answers papers which are being prepared by qualified experts at the request of the Council on Dental Therapeutics. Among the papers which are in preparation are those on fluorides, disinfection of instruments and general anesthetics.

Q. Are any major occupational hazards associated with the practice of dentistry?

A. The dentist is exposed to a variety of minor occupational hazards; however, the large life insurance companies do not consider that dental practice entails any unusual occupational risks.

Q. Is the life expectancy of dentists less than that of persons engaged in comparable occupations?

A. The largest life insurance companies in the United States have no data on the life expectancy of dentists. This would suggest that their life expectancy is not appreciably different from the general average.

Q. Is the mortality from heart disease greater among dentists than among the general population?

A. There are no United States data showing the mortality from heart disease among dentists. One large insurance company reported that "some unpublished data on dentists insured under ordinary policies indicate that their mortality is below that of males of the general population, and somewhat lower than that of physicians."

Data from England and Wales covering occupational mortality for the years 1930-1932 show that the death rate for dentists was 96 per cent of that of all males. There were, however, sixty deaths among dentists from heart disease of all kinds where 48 would have been expected on the basis of death rates for males of the general population. This is a ratio of actual to expected deaths of 125 per cent.

Q. Does the nervous tension under which many dentists work predispose to cardiac disease?

A. The importance of nervous tension in the causation of various systemic diseases, including cardiac disease, has not been evaluated completely. It is believed by some clinicians that nervous tension may predispose to certain forms of heart disease and also to gastric ulcer. However, the general constitutional make-up of the individual is probably more important than the particular occupation.

Q. How can the nervous tension of dental practice be minimized?

A. This can be minimized by efficient office management which delegates many of the duties and responsibilities commonly assumed by the dentist to auxiliary personnel; that is, the dental hygienist or assistant, and the secretary. Too long working hours, too many appointments and inadequate time for daily rest and for frequent short vacations predispose to undue fatigue, nervous tension and less efficient professional services.

Q. Is the dentist subjected to undue eyestrain?

A. There seems to be little doubt that the dentist's eyes are subjected to considerable strain. This is partly due to the fact that dental practice is concerned mainly with the treatment of small organs in regions which are difficult of

access and which necessitate indirect vision by means of a mirror.

An equal, if not greater, cause of eyestrain is inadequate illumination, which is all too common in the dental office. This may include inadequate illumination of the bracket table and instrument cabinets as well as of the operative field. Too great a difference in light intensity between the operating field and the bracket table and cabinets is an unrecognized cause of eyestrain.

Not only eyestrain but body fatigue may result from the uncomfortable operating position that dentists with bifocal glasses must assume in order to obtain proper use of the bifocal lenses. This can be eliminated by the use of reversed bifocal lenses, in which the close vision portion of the lens is at the top.

Q. Are eye injuries an important hazard of dental practice?

A. Eye infections and injuries, sometimes leading to loss of sight, are potentially important occupational hazards. Eye infections may follow contamination from expelled salivary droplets or from flying pieces of calculus, fillings or tooth fragments.

Although loss of sight secondary to infection is now minimized by the use of antibiotic agents, instances of serious eye infections, some of which caused loss of sight, have not been uncommon in past years.

The dentist always should protect his eyes by means of spectacles, especially when he is scaling or extracting teeth. If glasses are not required for the correction of visual defects, those with noncorrective lenses should be worn. Glasses also will protect the eyes from contaminated salivary droplets.

Q. Are dentists prone to develop dermatitis of occupational origin?

A. When dentistry is compared with many industries, the incidence of dermatitis of occupational origin is small. Dermatitis may become sufficiently severe to necessitate cessation of practice.

Q. What are some of the causes of occupational dermatitis in dentists? How can one be tested for sensitivity to procaine?

A. Procaine dermatitis is well known, and although it may be severe, it usually can be prevented by the use of rubber gloves when injections are being made. Actual proof of cutaneous allergy can be obtained by allowing the procaine solution to remain in contact with the intact skin for five minutes. Reactions are read after twenty-four hours. Most of the other local anesthetics, including Monocaine, contain an aromatic amino group on the benzene ring in the para position, thus precluding their substitution for procaine.

Many commercial chemical disinfecting solutions contain formaldehyde, which is a common and unsuspected cause of dermatitis among dentists. Even solutions which contain no formaldehyde may give rise to dermatitis because of their alkalinity.

The various essential oils and other medicaments used in dental practice may be the cause of dermatitis. Methyl methacrylate monomer is irritating, and some few persons may be sensitive to the polymerized form.

An important and frequently unrecognized cause of dermatitis is soap. The skin of some persons is extremely sensitive to alkalies. The writer knows of one dentist who was treated for more than a year for a progressive dermatitis of the hands. It eventually became so severe as to prevent practice. The dermatitis cleared up rapidly when nonsoapy synthetic detergents were used.

The dentist should seek the services of a competent dermatologist at the first indication of a dermatitis.

Q. Are the modern dental roentgen ray machines "safe," or do they represent an occupational hazard?

A. Modern dental roentgen ray machines are "shock proof" but they are not "safe" unless they are properly in-

stalled and used. When exposures are being made, the dentist and his assistant always should stand out of the path of the central rays, on the opposite side of the tube head from the focusing cone.

The dentist never should hold films in the patient's mouth. The effects of roentgen rays are cumulative and even when exposure is only occasional this practice may result eventually in roentgen ray burns, carcinomatous degeneration and loss of the affected part.

If the dental roentgen ray machine is adjacent to operating cubicles, the dental laboratory or the secretary's office, there should be adequate shielding to prevent undue exposure of persons working in these areas.

Q. How can one determine whether he is being excessively exposed to roentgen rays?

A. Tests for undue roentgen ray exposure can be made easily by fastening an ordinary paper clip with adhesive tape to the emulsion side of a regular intra-oral dental film. This prepared film should be carried, emulsion side out, in a pocket for one week and then processed. If the outline of the paper clip can be seen on the processed film there is excessive exposure to roentgen rays.

Q. Is there risk of mercury poisoning from the practice of kneading amalgam in the palm of the hand?

A. There is little danger of mercurialism from the kneading of amalgam in the bare palm. There are definite technical objections, however, to the manipulation of amalgam in the palm of the hand. This practice introduces moisture, fatty substances, bacteria, dirt and cellular debris into the amalgam. These substances affect adversely the physical properties of the amalgam restoration.

Q. Does the dentist run the risk of occupationally acquired syphilis?

A. Yes. Figures from the Surgeon General's office show that occupationally acquired syphilis occurs about eight times more often among dentists than among physicians. There are several explanations for this finding. Perhaps the most important factor is the dentist's common practice of putting his ungloved fingers in the patient's mouth before the oral tissues have been examined thoroughly for syphilitic lesions.

The dentist who does oral surgical operations also runs the risk of occupationally acquired syphilis if the Treponema pallidum organisms are in the blood stream, even in the absence of lesions of the oral mucosa.

Q. Is the dentist unduly exposed to respiratory infections?

A. Because of the number of patients seen by the dentist and the possibility of accidentally inhaling contaminated droplets, the dentist is exposed to infections of the respiratory passages during his working hours. These can be minimized by wearing a gauze mask or an intranasal filter when working on patients with colds.

It is important to develop the habit of working as far from the patient as is practicable. Proper use of the mouth mirror will help to prevent undue exposure.

The dentist always should wear a properly fitted and constructed mask when treating patients with open lesions of pulmonary tuberculosis. There is little evidence that intranasal sprays will protect the dentist against these infections.

Q. What other pathologic conditions, believed to be related to dental practice, are found commonly in dentists?

A. There are a number of minor conditions which are commonly found in dentists. They represent secondary changes caused or aggravated by standing in one place for many hours, often in an unnatural position and frequently with most of the weight of the body on one foot.

Flat feet, varicose veins and hemorrhoids are included among these defects. Specially designed shoe lasts will aid in compensating for flat feet, and

their use may prevent this defect. Some shoe manufacturers have special lasts for persons who are on their feet more or less constantly. The more frequent use of an operating stool will assist in preventing these defects.

Varicose veins and hemorrhoids may be aggravated by long periods of standing without frequent muscular activity of the extremities. The dentist should rest his legs several times during the day by placing his feet on the laboratory bench, desk or window sill so that they are above the general level of his body.

A lateral curvature of the spine, with one shoulder lower than the other, is a frequent mark of the dentist. Pains low in the back are common. These may be due in part to bearing most of the weight on one foot while operating and also to the unnatural and often inefficient patient-operator position.

RESEARCH COMMISSION

LIST OF CERTIFIED DENTAL MATERIALS

REVISED TO OCTOBER 31, 1947

Because there has been some confusion regarding certified dental materials, the Research Commission presents this summary to clarify the operation of its certification plan.

The first fundamental item in this plan is the existence of official American Dental Association Specifications for Dental Materials. These specifications are the outcome of research by the American Dental Association research fellowship at the National Bureau of Standards, correlated with the clinical experience of members of the Association.

As the second step in the operation of the plan, the manufacturers are invited to certify to the Research Commission that their products comply with the specifications. It would be manifestly impossible for the Commission (through the American Dental Association research fellowship at the National Bureau of Standards) to test every lot of every certified material. For this reason, the Commission has required that the manufacturer, on certifying a product, not only must guarantee that this product meets specification requirements but also must furnish evidence that he maintains a testing program adequate to insure continual compliance of the product.

On receipt of a certification for a new product with all required data, the Commission procures a random sample through regular trade channels, usually by asking a dentist to act as its agent. This sample is tested for compliance with all specification requirements. Only when the certification is complete and in proper form and the sample has passed all specification tests does the Commission accept the manufacturer's certification. The name of the product is then added to the list of certified dental materials.

This, however, is not the complete story. The continuation of any product on the list of certified dental materials is contingent on its maintenance at specification quality. Surveys of all prod-

ucts on the list are made by the American Dental Association research fellowship at the Commission's direction. These surveys are made on samples procured on the open market. Whenever a material fails to comply with the specification requirements, it is removed from the list and the manufacturer is notified that his certification of the product is no longer acceptable. Thus, although the Commission cannot test the entire production of dental materials, its certification plan calls for continuous testing by the manufacturer and check tests by the fellowship so that a constantly high level of quality of the products on the list will be maintained.

In the purchase of certified material for use in dental practice, these lists should be used as a buyer's guide. In addition, the package of material received should be checked for its exact name as given in the lists and for a statement thereon guaranteeing compliance with the specification. The Commission should be notified of any discrepancies.

Certified Amalgam Alloys (A.D.A. Specification No. 1)

Alloy	Manufacturer or Distributor
Accurate Metalloy (filings)	The L. D. Caulk Co.
Ackerman (filings)	Ackerman Dental Mfg. Co.
Argentum "A" cut; fine cut; medium cut; shavings	Hammond Dental Mfg. Co.
Aristaloy	Baker and Co., Inc.
Banner (filings)	Goldsmith Bros. Smelting & Refining Co.
Blue Diamond (filings)	Reliance Dental Mfg. Co.
Certified	Lee S. Smith & Son Mfg. Co.
Cresilver	Crescent Dental Mfg. Co.
Dee (filings)	Thomas J. Dee & Co.
Diamond Edge	Young-Baker & Co.
Excel	Daniels Dental Alloy Co.
Fellowship; New Fellowship	Dental Protective Supply Co.
Fleck's	Mizzy, Inc.
Garfield's	Garfield Smelting and Refining Co.
Gold Bond	Jefferson Laboratories
Lustraloy Regular; Cut T	Pfingst & Co.
Minimax (filings) 173; 177; 178; 183; White Gold & Platinum; (shavings) 177; 178	The Minimax Co.
Mission No. 5; No. 5 "A" Cut; No. 6	Henry F. Bruce Co.
Modeloy (quick setting filings)	Crescent Dental Mfg. Co.
Mynol Improved	Mynol Chemical Co.
New Deal	Miller Dental Co.
Odontographic "Improved" (filings)	Odontographic Mfg. Co.
Pearlol	Wildberg Bros. Smelting & Refining Co.
Precision	Precision Bur Co.
Research Oralloy	Precious Metals Research Works, Inc.
Royal Special First Setting; Super First Setting	Garhart Dental Specialty Co.
Silver Crown Fast; Medium; Slow	General Refineries, Inc.
Silverloy (filings); (shavings)	Crescent Dental Mfg. Co.
Speyer	Speyer Smelting and Refining Co.
S-C Medium (filings)	Stratford-Cookson Co.
S-R	Lee S. Smith & Son Mfg. Co.
Standard	Standard Dental Products Co.
Stratco	Edward P. Stratt
True Dentalloy (filings); (cut "A")	The S. S. White Dental Mfg. Co.

Twentieth Century Regular; Special	The L. D. Caulk Co.
Uniform	Henry Nelms & Son
Vertex	Vertex Dental Products Co.
White Beauty	Lang Dental Mfg. Co.

Certified Inlay Casting Investments (A.D.A. Specification No. 2)

Investment	Manufacturer or Distributor
Kerr Cristobalite-Inlay	Kerr Dental Mfg. Co.
Ransom and Randolph Gray	The Ransom & Randolph Co.
Security Improved Inlay	The Cleveland Dental Mfg. Co.
Steele's-Super	The Ransom & Randolph Co.

Certified Impression Compounds (A.D.A. Specification No. 3)

Compound	Type	Manufacturer or Distributor
Certified	I	Lee S. Smith & Son Mfg. Co.
Dresch	I	The Ransom & Randolph Co.
Kerr Perfection; No. 2 Soft Green; Gray	I	Kerr Dental Mfg. Co.
Mizzy—Low Heat	I	Mizzy, Inc.
S. S. White—Black—Tray	II	The S. S. White Dental Mfg. Co.

Certified Inlay Casting Waxes (A.D.A. Specification No. 4)

Wax	Manufacturer or Distributor
Caulk-Blue	The L. D. Caulk Co.
Kerr-Blue—Hard	Kerr Dental Mfg. Co.
Security	The Cleveland Dental Mfg. Co.
Sterling	Baker & Co., Inc.

Certified Inlay Casting Gold Alloys (A.D.A. Specification No. 5)

Type A, Soft

Alloy	Manufacturer or Distributor
Aderer-A-Soft	Julius Aderer, Inc.
Baker Inlay Soft	Baker & Co., Inc.
Bruce "A"	Henry F. Bruce Co.
Chilcast No. 1	Vernon-Benshoff Co.
Crown Inlay No. 2 Soft; K	General Refineries, Inc.
Deeone	Thomas J. Dee & Co.
GB Inlay No. 1 Soft	Goldsmith Bros. Smelting & Refining Co.
Jelenko Special Inlay	J. F. Jelenko & Co., Inc.
Krause Soft Inlay	Krause Gold Refinery
Research-A-Soft	Precious Metals Research Works, Inc.
Spyco Soft	Spyco Smelting & Refining Co.
S. S. White No. 2; No. 900; No. 940	The S. S. White Dental Mfg. Co.
Stern S	I. Stern & Co., Inc.
Williams No. 3; Will-Cast 22	The Williams Gold Refining Co., Inc.

Type B, Medium

Alloy	Manufacturer or Distributor
Aderer-B-Medium	Julius Aderer, Inc.
Baker Inlay Medium	Baker & Co., Inc.
Bruce "O"; No. 2	Henry F. Bruce Co.
Chilcast M; 1M; 2M	Vernon-Benshoff Co.

Crown Inlay No. 1 Hard; Knapp No. 2; T	General Refineries, Inc.
Deetwo	Thomas J. Dee & Co.
GB Inlay No. 2 Medium Hard	Goldsmith Bros. Smelting & Refining Co.
Jelenko Modulay; Platincast	J. F. Jelenko & Co., Inc.
Krause Hard Inlay	Krause Gold Refinery
Nelms E	Henry Nelms & Son
Ney-Oro A-1; A-10	The J. M. Ney Co.
Spyco Medium	Spyco Smelting & Refining Co.
S. S. White No. 1; No. 5; No. 820	The S. S. White Dental Mfg. Co.
Stern 1; No. 3290	I. Stern & Co., Inc.
Tinker No. 1; Inlay	Spyco Smelting & Refining Co.
Wildberg "A"	Wildberg Bros. Smelting & Refining Co.
Williams Pioneer; Special Inlay	The Williams Gold Refining Co., Inc.

Type C, Hard

Alloy	Manufacturer or Distributor
Aderer-C-Hard; "Dressel"	Julius Aderer, Inc.
Baker Hard Inlay	Baker & Co., Inc.
Bruce No. 3; No. 5	Henry F. Bruce Co.
Chilcast No. 2; No. 2-H	Vernon-Benshoff Co.
Crown No. 9; Knapp No. 3; Supreme Inlay; TT	General Refineries, Inc.
Deesix	Thomas J. Dee & Co.
GB Inlay No. 3 Hard	Goldsmith Bros. Smelting & Refining Co.
Jelenko Durocast; Firmilay	J. F. Jelenko & Co., Inc.
Krause KK	Krause Gold Refinery
Research Hard Cast No. 5; Inlay	Precious Metals Research Works, Inc.
Spyco No. 6	Spyco Smelting & Refining Co.
S. S. White No. 8; No. 13; No. 860 Hard	The S. S. White Dental Mfg. Co.
Stern 2; 3337; 3465; 6485	I. Stern & Co., Inc.
Tinker No. 1H; No. 2	Spyco Smelting & Refining Co.
Wildberg "C"	Wildberg Bros. Smelting & Refining Co.
Williams Klondiker; No. 1; Special "Four"	The Williams Gold Refining Co., Inc.

Certified Dental Mercuries (A.D.A. Specification No. 6)

Mercury	Manufacturer or Distributor
Argentum	Hammond Dental Mfg. Co.
Ballard's	Quicksilver Producers Association
Certified	Lee S. Smith & Son Mfg. Co.
Chemically Pure	The S. S. White Dental Mfg. Co.
Crown	General Refineries, Inc.
Dee	Thomas J. Dee & Co.
Dental	Goldsmith Bros. Smelting & Refining Co.
Dental, C. P.	F. W. Berk & Co., Inc.
Fellowship	Dental Protective Supply Co.
Garfield's	Garfield Smelting and Refining Co.
Garhart's Positively Pure	Garhart Dental Specialty Co.
Krause's Pure	Krause Gold Refineries
Minimax	The Minimax Co.
Mission	Henry F. Bruce Co.
Mynol	Mynol Chemical Co.
Ney's C. P.	The J. M. Ney Co.
Odontographic	Odontographic Mfg. Co.
Research	Precious Metals Research Works, Inc.

Spectropure	Baker & Co., Inc.
Twentieth Century	The L. D. Caulk Co.
Williams	The Williams Gold Refining Co., Inc. (Applies to Williams' one pound bottles only, as quarter pound containers are not glass.)

Certified Wrought Gold Wire Alloys (A.D.A. Specification No. 7)

Alloy	Manufacturer or Distributor
Aderer No. 1; No. 3; No. 4; No. 20 Clasp	Julius Aderer, Inc.
Baker 21; Q. A.	Baker & Co., Inc.
Crown Hylastic	General Refineries, Inc.
Deepep-Hard	Thomas J. Dee & Co.
GB Extra High Fusing; Medium Fusing; Regular High Fusing	Goldsmith Bros. Smelting & Refining Co.
Jelenko No. 3 Wire; Super Wire	J. F. Jelenko & Co., Inc.
Ney-Oro Elastic No. 4; Neydium 9	The J. M. Ney Co.
Spyco No. 2; No. 4	Spyco Smelting & Refining Co.
S. S. White No. 12; No. 61 Metalba	The S. S. White Dental Mfg. Co.
Stern No. 2657	I. Stern and Co., Inc.
Williams No. 1 Super; No. 2 High Fusing Clasp; No. 3 High Tensile	The Williams Gold Refining Co., Inc.
Vernon-Benshoff Clasp Wire No. 6	Vernon-Benshoff Co.

Certified Zinc Phosphate Cements (A.D.A. Specification No. 8, First Revision)

Cement	Manufacturer or Distributor
Ames Z-M	The W. V-B. Ames Co.
Bosworth's Zinc	Harry J. Bosworth Co.
Caulk Crown and Bridge; Petroid Improved; Tenacin	The L. D. Caulk Co.
Certicem	Lee S. Smith & Son Mfg. Co.
Fleck's Extraordinary	Mizzy, Inc.
S-C	Stratford-Cookson Co.
Smith's	Lee S. Smith & Son Mfg. Co.
S. S. White Silver Improved; Zinc; Zinc Improved	The S. S. White Dental Mfg. Co.

Certified Silicate Cements (A.D.A. Specification No. 9)

Cement	Manufacturer or Distributor
Ames Plastic Porcelain	The W. V-B. Ames Co.
Astralit	Premier Dental Products Co.
Baker Plastic Porcelain	Baker & Co., Inc.
DeTrey's Synthetic Porcelain	The L. D. Caulk Co.
Durodent Enamel	Oskar Schaefer
Smith's Certified Enamel Improved	Lee S. Smith & Son Mfg. Co.
S. S. White Filling Porcelain Improved	The S. S. White Dental Mfg. Co.

Certified Hydrocolloidal Impression Materials (A.D.A. Specification No. 11)

Material	Manufacturer or Distributor
Coe-Loid 66	Coe Laboratories, Inc.
Deelastic	Thomas J. Dee & Co.
Dentocoll	The L. D. Caulk Co.

Kerr Hydro-Colloid	Kerr Dental Mfg. Co.
Perfectocoll	Baker & Co., Inc.
Plasticoll	Lee S. Smith & Son Mfg. Co.
Surgident	Surgident, Ltd.

Certified Denture Resins (A.D.A. Specification No. 12)

Material	Form	Manufacturer or Distributor
Acralite	Clear; pink; powder-liquid	Acralite Co., Inc.
Ac-Ril	Pink; powder-liquid	Ac-Ril Dental Corporation
Acri-Lux	Pink; powder-liquid	Acri-Lux Dental Mfg. Co.
B-B	Clear; pink; powder-liquid	Bell Dental Products Co.
Certified	Pink; powder-liquid	Lee S. Smith & Son Mfg. Co.
Coralite	Pink; powder-liquid	Coralite Dental Products Co.
Crystolex, Regular	Pink; powder-liquid	Kerr Dental Mfg. Co.
Crystolex, Form 102	Pink; powder-liquid	
Densene 33	Clear; pink; powder-liquid	Cosmos Dental Products, Inc.
Denture Acrylic	Pink; powder-liquid	The S. S. White Dental Mfg. Co.
Hygienic	Pink; powder-liquid	The Hygienic Dental Rubber Co.
Justi-Tone	Pink; powder-liquid	H. D. Justi & Son, Inc.
Lang's	Pink; powder-liquid	Lang Dental Mfg. Co.
Lucitone	Clear; pink; plastic cake	The L. D. Caulk Co.
	Clear; pink; powder-liquid	
Luxene 44	Pink; plastic cake	Luxene, Inc.
Marvel	Pink; powder-liquid	Marvel Dental Products Co.
Premier	Clear; pink; powder-liquid	Premier Dental Products Co.
Opalex "45"	Pink; powder-liquid	The Opalex Co.
Vernonite	Clear; pink; plastic cake	Vernon-Benshoff Co.
	Pink; powder-liquid	
Vitacrilic D,L	Pink; powder-liquid	Fricke Dental Mfg. Co.
Vita-Lite	Clear; pink; powder-liquid	Vita-Lite Products Co.
Vitalon	Pink; powder-liquid	Austenal Laboratories, Inc.

COUNCIL ON DENTAL EDUCATION

CORRECTION OF REPORT ON FOREIGN CREDENTIALS

IN THE November 1, 1947 issue of THE JOURNAL, in the "Report of Committee on Foreign Credentials," the following statement appeared on page 672:

Eight states, Arizona, California, Illinois, Maryland, Massachusetts, Michigan, New Jersey and New York, will admit to their licensing examinations the graduates of one or more of the Canadian dental schools who satisfy all other requirements.

New Jersey should not have been included in this list as no Canadian schools appear on the approved list of dental schools of the New Jersey board.

REPORT ON DENTAL HEALTH BILLS IN CONGRESS

Dental Research Bill

THE federal bill of most importance to the dental profession is the dental research bill, S.176. This bill was introduced into the present Congress at the request of the Committee on Legislation of the American Dental Association with support from both major political parties. Those who joined in the introduction of the bill are Senators Taft of Ohio, Aiken of Vermont and Morse of Oregon for the Republicans and Senators Murray of Montana and Pepper of Florida for the Democrats. The bill was introduced on January 13, 1947, and was referred to the Senate Committee on Labor and Public Welfare. This committee waived formal hearings, gave the bill a favorable report and sent it to the floor of the Senate where it was passed on July 24. It then went to the House of Representatives where it was referred to the House Committee on Interstate and Foreign Commerce.

Briefly, S.176 would create a National Institute of Dental Research as a permanent division of the National Institute of Health in the United States Public Health Service for the purpose of conducting research in the cause and treatment of dental diseases and assisting public and private agencies in such research activities. It also would create a National Advisory Dental Research Council consisting of the Surgeon General of the United States Public Health Service and six appointed members, at least four of whom would be dentists. Further, it would authorize an appropriation of not more than $2,000,000 for erecting a suitable building and equipping it with adequate facilities, and in addition an annual appropriation of $730,000 for dental research purposes.

The latest information indicates that the House Committee on Interstate and Foreign Commerce will consider the dental research bill early in the regular session which started in January of this year. Two companion bills, both with the same wording as S.176, have already been introduced into the House. One bill is H.R.574, introduced by Congressman Harris of Arkansas, a Democrat and a member of the House committee. The other companion bill is H.R.4200, introduced by Congressman Brehm of Ohio, a Republican and a member of the American Dental Association. Thus the bill has support from members of both parties in the House. At this time it appears probable that the House committee will hold a hearing on the bill in 1948 and will give it a favorable report, and that it will be passed sometime in 1948.

Dental Grants-in-Aid Bill

The dental grants-in-aid bill, S.178, was introduced into the Senate by Senator Aiken, Republican of Vermont, and the Democratic Senators Pepper of Florida and Murray of Montana. The bill was referred to the Senate Committee on Labor and Public Welfare, but to date no action has been taken on it by the Senate committee.

Bills to Create Department of Health

There are several bills in Congress to create a new cabinet post to be known

as the Department of Health, Education and Security. The American Dental Association believes that S.140, "a bill to create an executive department of the Government to be known as the Department of Health, Education and Security," and S.712, "a bill to constitute the Federal Security Agency as a Department of Health, Education and Security," are not in the best interest of the health welfare of the public.

The American Dental Association, some years ago, officially announced that the health of our nation is of such paramount importance that it demands the establishment of a federal department of health, administered by a secretary of health, who would be a graduate in medicine and who would become a member of the President's cabinet. Within the department there should be a division of dentistry administered by a first assistant secretary, who would be a graduate in dentistry.

If a department of health is established, it should be kept distinct and separate from other departments of the federal government. Also, experience in dental health activities over a long period of time has proved definitely that the dental division in a public health department will function most efficiently when it is administered by dentists who have been trained in administrative work.

Hearings have been held by the Senate committee on these bills, but so far no further action has been taken. A controversy has arisen as to the prominence and position to be given to health and to security. The health professions wish to have a separate department of health. Moreover, these bills are related to other health and security bills, and at the present time it appears likely that no further action will be taken on them by this Congress.

National Health Bills

The subcommittee on health of the Senate Committee on Education and Public Welfare started hearings on the national health bill, S.545, last spring. Originally the hearings were scheduled to consider only the Taft national health bill, S.545, and were to last about three or four weeks. However, the new compulsory health insurance bill, S.1320, was introduced a few days before the hearings started and later was included in the hearings. This resulted in extension of the hearings far beyond the time originally allotted for them. The hearings had not been completed when Congress adjourned last July, and they are scheduled to be resumed during the second regular session.

At the hearings held in May and June of 1947, Carl O. Flagstad, chairman of the Committee on Legislation, presented a statement of the position of the American Dental Association on the Taft national health bill, S.545. This statement and the oral testimony of Dr. Flagstad have been published in THE JOURNAL.[1, 2] Briefly, the American Dental Association asked that the bill be amended to give the individual states more freedom in developing an optimum state-wide dental health program in accordance with existing dental personnel and facilities.

In view of the political nature of these bills and the prominence they will be given as issues in the coming campaigns, it is difficult to predict what action will be taken on them during this session of Congress. The Senate committee will probably issue a favorable report on the Taft bill, and it may be brought to a vote. It is generally conceded that the new compulsory health insurance bill will not be passed during the present Congress. So far the House has not considered either bill, and it has scheduled no hearings on them for this session.—*George H. Fox, Secretary.*

1. Testimony of American Dental Association at Hearings on National Health Bill, S.545. *J.A.D.A.* 35:216 (August 1) 1947.
2. Testimony of American Dental Association at Hearings on National Health Bill, S.545. *J.A.D.A.* 36:96 (January) 1948.

NEWSPAPER ADVERTISEMENTS ARE NOT DISPLAY SIGNS SAYS TEXAS COURT

THE Court of Civil Appeals of Texas in a recent decision (State Board of Dental Examiners v. Bickham, 203 S.W. (2d) 563, Texas, 1947) held that the large newspaper advertisements of a dentist did not constitute unprofessional conduct since the Texas law defines unprofessional conduct to include advertising by means of large display signs, and the term "display signs" cannot be enlarged to include newspaper advertisements.

"Signs" are not "ads" said the Court and quoted from the New Century dictionary the definition of the word "sign," which reads:

Now, usually, an inscribed board, plate, space, or the like serving for information, guidance, advertisement, etc., as on or before a building or a place of business, or along a street or road.

The Court commented:

We believe that the "usual sense" of the word, as used in "common language," and the "ordinary significance of the word," excludes the idea that "display ads" in newspapers is comprehended in the term "display signs." . . . The statute limiting "large display" to "signs," excludes "display ads." "Signs" are not "ads." It is unfortunate that the Texas Legislature limited such acts of advertising to "signs," instead of providing, as is the law of Missouri, Oregon, Wisconsin and other states to include unlawful advertising by means of "large display," either by "signs" or "ads,' without limitation as to where such advertisement shall be placed.—*George H. Fox, Secretary.*

CASES AND COMMENTS

Facial Venous Thrombosis Caused by Trauma: Report of Case. By Matthew Lozier, D.D.S., New York.

By the term "venous thrombosis" is meant occlusion of a vein by formation of a blood clot within its walls. This condition may be caused by either trauma of a chemical or mechanical nature or some purely septic infection. Venous stasis in a lower extremity and postpartum complications are frequent causes of thrombosis and thrombophlebitis of the femoral and iliac arteries.

In the head and neck infections of the face and mouth are the principal factors in causing venous thrombosis, which, because of the extensive venous anastomosis of these regions and the frequent reversal of venous flow, may give rise to thrombosis of the cavernous sinus. Such cases have been reported from time to time. Since the anterior facial vein has no valves and since its walls are not as flaccid as those of most superficial veins, these grave occurrences are understandable.

However, thrombosis of the facial vein which was attributable purely to trauma, such as that induced by treatment of the root canal, has, to my knowledge, not heretofore been reported, nor have I personally encountered such a case in my own practice.

Report of Case

An active, middle-aged, unmarried woman, without a significant medical history and apparently in good health, came to her family dentist in February 1947 for treatment of the root canal of the maxillary right lateral incisor because of exposure of the pulp. According to the information submitted to me later, although there were no symptoms referable to the tooth and the preoperative roentgenograph disclosed a small noncircumscribed periapical rarefaction, there was still some evidence of vitality during the attempted extirpation of the nerve tissue. To permit a more painless operation, a submucous injection of a 2 per cent solution of procaine hydrochloride-epinephrine was made, and the extirpation was carried out successfully.

When the root canal was flushed out with a mild antiseptic alkaline solution and a broach was passed again through its entire length and possibly also slightly beyond, it was noticed that the contour of the patient's face suddenly had changed. Her entire upper lip, right cheek, nose and lower eyelid appeared enormously swollen and distorted. The patient complained of a pronounced sensation of heaviness and inability to move the muscles of her face. However, pain, numbness and other local and general distressing signs were entirely absent.

When the patient was examined by me shortly after the incident, she appeared to be highly apprehensive and disfigured, though otherwise she was quite normal. The pulse rate, temperature, respirations and blood pressure were within normal limits. The vision was unaffected. There was no evidence of ecchymosis, chemosis, palpable glands, trismus, crepitation or tenderness in the affected region or in the adjoining tissue.

The swelling of the patient's face was hard, unyielding and practically painless to touch; normal sensation to contact was present. The affected region did not pit or noticeably change its normal contour on applied pressure. The lower lip, left side of the nose, cheek and eyelid, as well as the entire forehead, neck and ears, appeared to be entirely normal. There was little evidence of infiltration or tenderness in the muco-labial and muco-buccal folds. There was no apparent change in any of the intra-oral structures, and all the teeth in the upper jaw with the exception of the right lateral incisor and devitalized cuspid responded normally to testing for vitality. Roentgenologic examination was essentially negative.

A diagnosis of venous thrombosis caused by accidentally inflicted trauma was made, and the patient was reassured as to a favorable prognosis. Intermittent cold applications to the affected area, careful diet, proper elimination and adequate rest were advised. With the exception of a sedative no medication was prescribed.

The patient was observed daily for two weeks, during which time the swelling gradually disappeared. The contour of her face was

Formerly instructor in oral surgery, New York Post-Graduate Medical School and Hospital.

entirely normal at the end of the second week. At no time was there any evidence of abnormal temperature, toxicity, chemosis, ecchymosis or undue discomfort, and she apparently suffered no undue ill effects from the incident.

A week after the patient's condition had returned to normal, the treatment of the root canal was completed and a resection was performed, both without any untoward complications.

Discussion

For differential diagnosis, angioneurotic edema, ecchymosis and hematoma, and possibly also emphysema could be taken into consideration.

Angioneurotic edema is usually a symptom rather than a definite clinical entity. It may be an indication of some severe emotional disturbance, focal infection, hypersensitivity, food and drug allergy or an endocrine disturbance. The condition, which appears suddenly without apparent cause, has a tendency to recur. The swelling comes on quickly and spontaneously and disappears with equal rapidity. There usually is a history of similar past occurrences which have subsided without specific treatment.

Hematoma and ecchymosis may occur after deep block injections, especially after injections in the region of the posterior superior dental nerve. Such a condition can result when a hypodermic needle with a long bevel is inserted accidentally into a blood vessel, with resultant formation of a circumscribed portion of tissue containing a pool of extravasated blood. In most cases the skin over the affected region soon will assume a cyanosed condition. The discoloration possibly is due to the breakdown of erythrocytes with the liberation of iron. Failure to avoid deposition of the anesthetic solution into the corpus adiposum buccae, because of failure to retract it adequately, will produce a hematoma, ecchymosis or petechia. When in the injection of the posterior superior dental nerve, an injection is made inadvertently into the pterygoid plexus of veins, a hematoma in the region of the temporomandibular joint may result. This accident also can occur when the long hypodermic needle is inserted too close to the bone in an intra-oral infra-orbital injection, with resultant infiltration of the caninus muscle, or it can occur when the injection is made too close to the outer surface, thus infiltrating the quadratus muscle.

The term "emphysema," or abnormal presence of air in certain parts of the body, in its restricted sense generally is employed to designate a peculiar affection in the lungs. The patient with emphysema has a puffy and somewhat bloated appearance, after inadvertent injections of air into interstices of subcutaneous connective tissue. Emphysema was observed in several cases in which swelling appeared immediately after extraction of teeth. Pressure on the resulting swelling produced a distinct cracking noise not unlike the kind produced by parchment paper.—*369 East 149th Street.*

Nitrous Oxide-Oxygen Analgesia. By John H. Ernst, M.B., technician, McKesson Appliance Co., Toledo, Ohio.

Experimentation and research in analgesia and anesthesia have altered a great many formerly accepted theories in regard to the use of analgesia in dental practice and the technic employed. Although the following suggestions are in the experimental stage, it is hoped that, through their study and variations in technic by the men in practice, an improved method may evolve.

The following suggestions are made for such procedures as excavation of cavities, incision of gum flaps and abscesses, preparation of abutments for crowns and bridges, curettage of pyorrheal pockets, scaling and flushing of dry sockets. Nitrous oxide is one of the oldest analgesic agents, and in combination with an abundance of oxygen it should prove harmless. It is pleasant to take, and there is a general feeling of well being on the part of the patient.

The following percentages have been used with satisfactory results: 85 per cent oxygen and 15 per cent nitrous oxide, or 90 per cent oxygen and 10 per cent nitrous oxide, at 2 to 5 mm. pressure. Other proportions will suggest themselves.—*2100 Madison Building.*

BOOK REVIEWS

Practical Anesthesia for Dental and Oral Surgery. By Harry M. Seldin, D.D.S. Third edition. Revised. 562 pages, with 238 illustrations. Philadelphia: Lea and Febiger, 1947.

The third edition of this book contains the comprehensive story of the various anesthetic agents and their methods of use in relieving pain in dental and oral surgical procedures.

The importance of the anesthetist's having a knowledge of regional anatomy is correctly stressed as the basis for good block anesthesia with local anesthetic agents. The author has demonstrated the various intra-oral and extra-oral technics for the administration of local anesthetics by injection. The use and abuse of local anesthesia are discussed, as well as many of the complications that follow its injudicious use. These chapters have varied but little from the second edition of this text.

"The Selection of Anesthetics for Oral Operations" (chapter 14) is short, clear and concise and contains much valuable information. The next chapter, "Nitrous Oxide-Oxygen Anesthesia," is most comprehensively presented in minute detail. It is well done and, the reviewer believes, indicates the author's own choice of general anesthetic agents. The chapter on "Determination of Poor Anesthetic Risks" gives the student excellent methods for evaluating the safety of general anesthesia for certain patients, as well as the surgical risks accompanying some of the procedures involved.

"The Physiology of Inhalation Anesthesia" has been thoroughly revised, but, as the author states, for a book covering both local and general anesthesia, it necessarily must be brief. It is, however, clear and concise. It covers nearly all of the high points for practical use of anesthesia in the office and most of the well-known theories of the physiology of the respiratory system in relation to gaseous anesthetic agents.

Under the subject of "Premedication" it is regrettable that the author makes the statement: "Avertin (tribomoethanol) may be dismissed briefly as being entirely unsuited for dental use, either as an anesthetic or as a premedicating agent." Many oral surgeons have found Avertin to be a highly valuable basal anesthetic agent and have used it successfully for years, from both the viewpoint of the operating surgeons and the reactions of the patient. It is true that it is not suitable for office use, but as a basal anesthetic for major oral surgery in selected cases it certainly should be considered in our selection of anesthetic agents.

Regarding another general anesthetic agent, thiopental sodium (Pentothal sodium, Abbott), it is unfortunate that the statement was made that this agent could not take the place of nitrous oxide and oxygen as the anesthetic of choice in oral surgery in the office. Many oral surgeons are using thiopental sodium as their anesthetic of choice in office practice today. It appears to this reviewer that the use of this agent for operations of relatively short duration will continue to increase in popularity. From this part of the text it is presumed that the author does not look favorably on this method of anesthetization.

The author has pointed out the use of thiopental sodium for induction of difficult patients who are then maintained with equal parts of nitrous oxide and oxygen. This method has certainly been a great help for both surgeon and anesthetist and has greatly reduced the necessity of saturating the patient with nitrous oxide, with the attending anoxia.

The foregoing method of administration produces profound anesthesia, prevents hypoxia in the alcoholic, plethoric and athletic types of patients, and at the same time, as the author points out, eliminates the use of potent anesthetic agents such as ethylene and cyclopropane which are explosive in nature.

This authoritative textbook is recommended to the dental student and the practitioner as a valuable treatise on anesthesia and anesthetic agents.—*J. J. Stetzer, Jr.*

Clinical Pathology and Treatment of the Dental Pulp and Periodontal Tissues. By Edgar D. Coolidge, D.D.S., M.S., B.S. 511 pages, with 351 illustrations. Second edition. Price $7. Philadelphia: Lea & Febiger, 1946.

The second edition contains some new material and a modified rearrangement in limited sections. Discussion of periodontal dis-

eases is divided into three chapters instead of two, with a revised and more acceptable terminology.

The discussion of hyperplasia of the gingival tissues as a separate and new chapter (chapter 18), which follows the chapter on gingivitis associated with systemic disturbances, is confusing and superfluous. Scorbutic, hormonal, diabetic, leukemic and drug hyperplasia are discussed as though they were distinct and specific types; yet diagnostic differentiation is not made by the author.

On the other hand, the author's excellent discussion on relief of pain could well have been given a separate chapter instead of being included in the chapter on acute inflammation of the apical periodontal tissues. As it is, it could be overlooked by anyone not primarily concerned with pulpal disease.

In general, a wealth of material is presented but it is not organized for ready reference by the average student or dentist. For example, etiology of gingivitis is not summarized in any one chapter but is discussed in six chapters under the treatment for the type of the disease according to cause. To obtain clear conceptions and to avoid misunderstanding or overlooking of data, the book must be read like a novel, chapter after chapter, at least so far as the two general divisions on pulp and periodontal tissues are concerned.

Another example of this lack of organization is that, if one looks up the chapter on treatment of suppurating periodontal pockets (chapter 20), one is given no indication that chapter 12, 200 pages before, is devoted to a discussion of the dental hygiene and toothbrushing technic recommended. No cross reference is made here to direct the reader, although such references are occasionally made in other topics.

The title suggests more specific description of clinical symptoms than is usually found in the book. For example, regarding gingivitis, the statement is made that "so little discomfort is experienced by the patient in the early stages of gingivitis that it generally remains neglected until it has progressed sufficiently to cause considerable damage to the supporting tissue." Yet, in the discussion of clinical pathology and diagnosis, before any description of clinical symptoms is given, there are seventeen lines, including the statement that gingivitis usually disappears after treatment. This description is mainly of subjective criteria such as "brushing causes hemorrhage and sensitivity," rather than clearly defined clinical signs which the dentist should be able to employ in recognizing the onset of the disease before the patient is aware of its presence. There is no specific description of the various color changes which may be observed, or of common areas where such changes may be noted; no mention of changes in surface texture, and only indirect mention of changes in contour. The paragraph on microscopic findings, although interesting, does not add to the clinical diagnosis or pathology.

Substitution of more recent references, for example in the section on dietetics, would have avoided questionable statements. Many advances have been made in the seven years since the first edition of the book was published. The author has used the material most recently available in those fields in which he is most closely associated.

The author is to be commended on his careful attention to definition of terms. The only confusion in this respect occurs in chapter 11, which deals with inflammatory disturbances in apical periodontal tissues. Regular inclusion of the word "apical" before "periodontitis" would have made it clearer that the more common "pocket" form of periodontitis was not meant.

Technically the second edition is not as good as the first. Illustrations are not sharp and clear and there are many typographic errors.

This book is recommended for study rather than for reference. Acquaintance with the considered judgment of the author, which is based on years of experience and study in wide fields, will add to every dentist's development and knowledge of practical procedure.—*Dorothea F. Radusch.*

Theory and Practice of Crown and Bridge Prosthesis. By Stanley D. Tylman, A.B., D.D.S., M. S. Second edition. 960 pages, with 1273 text illustrations and 9 color plates. Price $12.50. St. Louis: The C. V. Mosby Co., 1947.

This well written book covers all of the basic problems involved in the practice of crown and bridge prosthesis. It is interesting as well as instructive and contains many excellent illustrations.

The book is intended for both the dental

student and the practicing dentist. It begins with a short history of fixed partial denture prosthesis, followed by a chapter on definitions and the purposes of prosthetic restorations.

Considerable space is given to a detailed study of oral diagnosis, including the hygienic and therapeutic considerations involved, structure of teeth and supporting tissues and loss of tooth structure as it effects restoration by means of fixed partial dentures. The author next considers the teeth to be used as abutments. This section includes the study of masticatory forces, equitable distribution of forces, normal occlusion and biologic interpretation of related physical and mechanical principles.

There are the all-important chapters devoted to the preparation of teeth for both intracoronal and extracoronal retainers. Here the author adheres rather closely to the principles of Black. He has described various types of inlay and crown preparations, all of which are illustrated by many excellent drawings and photographs. Instrumentation is discussed in detail, and steps in procedure and precautionary measures to be observed are listed.

A large portion of the book is devoted to a description of the various types of fixed partial dentures and their construction. The author has described both the direct and indirect methods of making wax patterns and also the processes for making dental castings. Technics for pontic construction and the soldering, finishing and cementation of bridges are well illustrated and described. The chapters on porcelain veneer crowns and porcelain bridges are well written and should stimulate a re-evaluation of this material as a means of restoring missing segments of the dental arch.

There are four new chapters on uses of the acrylic resins in crown and bridge prosthesis. The author gives a good description of synthetic resins, as well as methods of manipulation, their characteristics and the advantages and disadvantages of their use in dentistry. He has described in detail and illustrated the construction of acrylic crowns and complete acrylic bridges.

There is a new chapter on "Oral Rehabilitation." The author recognizes the fact that some cases require the restoration of the entire occlusion to a normal condition and that these cases require a careful consideration of the position of the mandible in relation to the maxilla. He has also described a method of procedure for establishing a completely new occlusion between the upper and lower teeth. Here it would have been propitious for the author to include other methods of approach to this problem, for example, the views of those who believe that the natural path of each condyle and the incisal guide, as established by the dentist, are necessarily predetermining factors in establishing a functional occlusion in many cases.

The entire bibliography is complete and well chosen.—*Earl A. Nelson.*

How to Interpret Social Welfare. By Helen Cody Baker, and Mary Swain Routzahn. 141 pages, with 26 illustrations. Index. Price $2.50. Brattleboro, Vt.: E. L. Hildreth & Co., 1947.

Mrs. Baker, a columnist for a Chicago newspaper, and Mrs. Routzahn, who has been with the Russell Sage Foundation for thirty-five years, have subtitled their book "A Study in Public Relations," which best expresses the content of the book. It will be of greatest value to professional workers and administrators who are called on to deal with the public, write letters and bulletins about health and welfare services, and in general improve relations between the public and their association or group. The interpretation of social work constitutes the content of the early chapters in which the authors explain in some detail the responsibility that associations, companies and groups have to their public. Examples are given of the manner in which many of these groups meet their responsibilities.

Throughout the book, examples are given of the ways in which talks and explanations should be organized for such categories as (1) "in conversation," (2) "in informal meetings," (3) "in formal meetings," and (4) "on the radio." The use of written material is handled in the same way, with illustrations and examples of letters, bulletins, annual reports and newspaper articles. The whole subject of the use of visual aids as a means of getting material across to audiences and readers is discussed.

The authors have included a list of reading references which covers all of the chapters in the book. This is in keeping with the fact that the book has been so designed that it can be

used as a course of study or for a series of lectures.

The book is not exhaustive in its coverage of various subjects but it does constitute a worthwhile and valuable overview of the field. It is valuable reading for those whose work requires them to meet the public, prepare releases, write annual reports, or arrange for meetings. Many readers will find that they are already familiar with a large proportion of the information given in the book.—*Shailer Peterson.*

Collected Lectures: A Study of the Fundamental Pathology of Periodontal Disease. By James Nuckolls, and Robert N. Rule, Jr. 77 pages, with 35 illustrations. Price $3.50. Second compilation. San Francisco: Lithotype Process Company, 1947.

This is a rather curious publication. It is offered as an aid in formulating a background for undergraduate and refresher courses. The closely packed basic information contained in the book would be of inestimable value to an undergraduate or refresher student were it reviewed and reconsidered with the view to better correlation. The first forty-five pages consist of a mixture of detailed hypothetical and factual information. Strangely enough, the material used in this section is made little use of in the second section, which presumably deals directly with the treatment of periodontal lesions, their cause, treatment and cure. Peculiar also is the illustrated material which is diagrammatic. Photomicrographs would be more factual. Rat material is used whereas human material is available for such studies.

Why Nuckolls and Rule should have been satisfied to terminate their review of the literature as regards the story of inflammation with V. Menkin's work on the "Dynamics of Inflammation," as though it were an end result instead of just a beginning, is difficult to guess. There seems to be a tendency to favor Menkin's ideas even though the bibliography offered may have provided a different and equally satisfactory basis for treatment. Surely, no treatise on inflammation could be considered as complete without a thorough study of Drinker and Yoffey's great work on lymphatics, lymph and lymphoid tissue.

Nuckolls and Rule have chosen to accept Menkin's thesis on inflammation which implies that the inflammatory fluid exudate is at first serous and later becomes fibrinous. A fibrin clot is supposed to occlude the lymphatic capillaries so that the vessel appears to be thrombosed. Such a condition probably does not exist in living tissues, although microscopic sections seem to depict it. Postmortem changes producing shrinkage of tissues by the use of fixatives probably account for such findings.

It is unfortunate that these authors predicate a philosophy of treatment on Menkin's thesis only. A consideration of Drinker and Yoffey's work might have developed another approach in the management of periodontal conditions. Drinker and Yoffey have called attention to the fact that in acute inflammation the lymphatic capillaries are wide open because their walls, being attached to surrounding tissues, are drawn apart when liquids and cellular elements are added to the site of inflammation as a consequence of blood capillary leaks (permeability). The lymph vessels continue to carry lymph to the nodes, indicating that the flow of lymph continues; hence the lymph capillaries are not occluded. Drinker and Yoffey point out that the reason more fluid and cellular elements are not removed from the inflammatory region is because of the character of the exudate. Fibrin tends to thicken it. Serum globulin particles are too large to pass through the lymphatic capillaries; hence the stasis.

The objective in treatment should be to remove extravascular fluid and cellular elements left in the inflammatory region rather than to supply a supposed lack of oxygen. Lundquist[1] has already discussed this.

For a student who has a fairly good basic knowledge of the structure, development and biochemical possibilities of the investing tissues of teeth, and of bone formation and bone metabolism, Nuckolls and Rule's publication affords a rather satisfactory review of the literature covering these subjects.—*G. R. Lundquist.*

1. Lundquist, G. R.: Periodontal Involvement and Its Management. *J.A.D.A.* 32:298 (March) 1945.

CURRENT LITERATURE

Exposed Dental Pulp as a Portal of Entry for the Virus of Poliomyelitis. S. Finn, R. F. Korns and Anne M. Bahlke. Am. J. Hyg. 46:177, September 1947.

Several recent reports which tend to show a relation between pulpal exposure and poliomyelitis are reviewed.

In part of the study, siblings of poliomyelitis patients of comparable age and sex were used as controls. The observations were made in Buffalo, Rochester, Amsterdam and West Haverstraw, New York, using a throat stick and pen light. Only those teeth which were badly broken-down and in which there was no doubt of exposure were counted as having the pulp involved. All questionable teeth were considered not to have exposed pulps. All extracted teeth were listed as exposures.

Of 70 patients with poliomyelitis, 45.7 per cent showed pulp exposure, and of 119 siblings of these patients, 45.4 per cent showed pulp exposure. Of 773 school children in a community which recently had experienced an extensive epidemic of poliomyelitis, 45.5 had dental pulp exposure. In the same community, 45.2 per cent of 22 poliomyelitis patients had pulp exposure. In another group of 151 poliomyelitis patients in a reconstruction home, 41.7 per cent were found to have pulp exposure. There were no specific controls for the latter group.—*Donald A. Wallace.*

Some Observations on Bleeding Tendency in Thrombocytopenic Purpura. J. G. Allen, George Bogardus, L. O. Jacobson and C. L. Spurr. Ann. Int. Med. 27:382, September 1947.

It was reported previously that in patients with irradiation hemorrhage an anticoagulant was present in the blood which was indistinguishable from heparin. It also was found that the hemorrhagic tendency could be prevented in dogs by the intravenous injection of protamine sulfate or toluidine blue, which renders heparin biologically inactive.

This report is concerned primarily with the effect of intravenous injections of toluidine blue on the hemorrhagic manifestations of thrombocytopenia. Six cases are reported in which the patients received toluidine blue, and in all of them the tendency for spontaneous hemorrhage and formation of petechiae either was decreased or eliminated. Of interest to the dentist is the fact that in 4 of the 6 cases spontaneous bleeding of the gingivae responded to the systemic treatment.

The report also deals with a study of the effect of heparin on the clotting time of whole blood of patients with thrombocytopenic purpura. Heparin was added to the blood *in vitro*, and more protamine sulfate was necessary to restore the normal clotting time in the thrombocytopenic blood than was required by normal controls. It was found that the heparin tolerance could be increased to normal by giving the patient injections of toluidine blue.—*William G. Shafer.*

Gangrenous Stomatitis. Kalman Kohn. Mil. Surgeon 101:218, September 1947.

Reporting on cases observed at the Dental Clinic, College of Medicine and Dentistry, West China Union University, the author offers a classification of gangrenous stomatitis based on topographic localization of the disease: I, gangrenostomatitis buccalis, mild and severe; II, gangrenostomatitis labiomentalis, and III, gangrenostomatitis labiomaxillaris. Prognosis is good for groups I and II but not for III.

Most cases were in an advanced stage, and the majority of the patients were less than 4 years of age; the younger the child, the more severe was the disease. Children affected were undernourished and belonged to the poorer classes. The history invariably revealed that prior to the condition the patient had some disease, such as measles, smallpox, diarrhea, unknown fever (malaria) or chronic neglected Vincent's infection.

Gangrenous stomatitis is characterized by a specific nauseous odor. It is not contagious. —*James Springer.*

Histochemical Demonstration of Alkaline Phosphatase in Decalcified Dental and Osseous Tissues. R. O. Greep, C. J. Fischer and Anna Morse. Science 105:666, June 27, 1947.

Histochemical studies on alkaline phosphatase in bones and teeth have been restricted to the incipient stage of mineral deposition, owing to the fact that it soon becomes impos-

sible to section these structures without first decalcifying them. Employment of acids to remove the mineral has resulted in destruction of this enzyme. It is obviously desirable to learn the localization and relative activity of this enzyme in bones and teeth throughout their developmental history.

This paper describes a decalcification process, used on the heads of 28 day old rats, which preserves the alkaline phosphatase activity for histochemical study. The range in hydrogen-ion concentration over which decalcification could be accomplished without destroying alkaline phosphatase was found to be in the pH range of 4.8 to 5.0. When this range was exceeded on the alkaline side, the rate of decalcification became unduly slow: with a slight increase in acidity, the alkaline phosphatase was lost.—*Hyman Goldberg.*

Dental Services Received by Children in a New York Clinic. Isidore Altman. Pub. Health Rep. 62:1355, September 19, 1947.

An analysis is presented of the dental records of 1,519 clinic patients at the Murray Hill Health Service of New York, which provides, among other services, low cost dental care to persons who cannot afford treatment by private practitioners. Patients were between 5 and 16 years of age, the average age being 11.3 years. Complete tabulation was made of 1,351 records.

Routine treatment for patients included roentgenographic examination, prophylaxis, restorations and extractions. Initial treatment was completed when a patient required no further treatment and was given an appointment card dated six months hence. The initial series was completed by 61 per cent of the children. Of these, 27 per cent failed to return for subsequent treatment; 22 per cent returned on first call but were not current in their subsequent treatment, and 12 per cent could be considered up to date in treatment history. Younger children showed a stronger inclination to complete treatment, and girls evidenced somewhat greater perseverance in obtaining treatment than did boys.

The children were divided into two groups based on completion of or failure to complete the initial series. The former group had an average of 6.8 teeth per child to be filled and 0.9 of a tooth to be extracted. The latter group required considerably more care—9.0 teeth to be filled and 1.6 teeth to be extracted. The average interval between completion of the initial series and the start of the first recall was eleven months in 448 children. At first recall they required fillings in 4.4 teeth and extraction of 0.3 of a tooth. Comparison of children who returned for first recall with those who did not shows that at initial examination each group had an average of about 8 teeth in need of filling or extraction. The similarity between the two groups suggests that caries susceptibility was not a factor in selection of children who returned for first recall.

The approximate annual increment in dental need as measured for 142 children who returned for first recall in ten to fifteen months was as follows: fillings, deciduous teeth, 1.0, and permanent teeth, 3.6; extractions, deciduous teeth, 0.2, and permanent teeth, 0.02. Returning for second recall after an average interval of nine months, 214 children required fillings in 4.1 teeth and extraction of 0.2 of a tooth, slightly less than the services needed on first recall.

The average number of visits per service, combining all series of treatments, was as follows: prophylaxis, 1.10; deciduous teeth filled, 1.02; permanent teeth filled, 1.09; deciduous teeth extracted, 0.78, and permanent teeth extracted, 0.96. Comparison with visits and services received in a children's dental clinic in Philadelphia showed marked similarities. Although the New York clinic had a somewhat greater number of teeth requiring care, the differences might be accounted for by use of roentgenographic examination and greater average interval between recalls in New York and age differences.—*James Springer.*

Bleeding Gums in Army Personnel. A. E. Light. Bull. U. S. Army M. Dept. 7:789, September 1947.

This report is a result of a survey conducted in sixty U. S. Army units stationed in England during October and November of 1944. The criteria established for bleeding gums were based on the ready production of bleeding by gentle pressure on the gums. Several tables are given which (1) indicate that the incidence of bleeding gums increases with lower rank, length of service (especially overseas) and age, (2) tabulate the soldiers with bleeding gums in relation to their native state, (3) tabulate the rejection by the soldiers of foods containing vitamin C in relation to the number of soldiers with and without bleeding

gums and (4) show the incidence of bleeding gums in other smaller groups of Army personnel.—*William G. Shafer.*

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Relative Merits of Vacuum Investing of Small Castings as Compared to Conventional Methods. R. W. Phillips, Indiana University.—343.

***The Effect of Wetting Agents on Oral Lactobacilli. Preliminary Report.** Frank E. Walter and Harve J. Carlson, Western Reserve University and Babies and Childrens Hospital, Cleveland.—353.

***Tryptophane in Carbohydrate Metabolism.** Naomi C. Turner and George E. Crowell, Boston.—359.

***Penicillin and Caries Activity.** H. A. Zander and B. G. Bibby, Tufts College Dental School.—365.

***Effects of Topical Sodium Fluoride in the Mandibular Teeth.** A. L. Russell, State Board of Health, Pierre, South Dakota.—369.

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***The Role of Oxalates in Rat Dental Caries.** C. A. Schlack, S. R. Howell, B. L. Taylor, V. J. Berzinskas and M. H. Aborn, National Naval Medical Center, Bethesda, Maryland.—383.

The Effect of Wetting Agents on Oral Lactobacilli. Frank E. Walter and Harve J. Carlson.

The effect of the addition of eighty-three surface-active agents on cultures of recently isolated oral lactobacilli was investigated. On agar, the Oxford cup method was used, and results were read in millimeters of inhibition or stimulation.

In broth, the effects were measured by changes in pH, turbidity and counts of plated subcultures.

Stimulation and inhibition were demonstrated as a result of the addition of varied amounts of the agents to liquid and solid mediums.

An indication of the potentialities of these findings is noted.

Tryptophane in Carbohydrate Metabolism. Naomi C. Turner and George E. Crowell.

When the saliva of persons with rampant active caries is mixed with an equal part of a 1 per cent solution of cornstarch, it develops in a two hour interval at room temperature about eight times as much acid as does the saliva of persons free from caries.

The ingestion of crystalline tryptophane by a small group of volunteers changed appreciably the amount of acid produced under these conditions. Caution was used to keep the dosage of tryptophane sufficiently low to avoid the possibility of hypoglycemia.

An hypothesis is proposed that tryptophane, or a similar molecule containing indole, acts as part of an enzyme system in the saliva and inhibits the production of acid from starch by condensing with an aldehyde group during starch degradation.

In the course of microscopic examination of saliva after acid hydrolysis, tyrosine was found. This microscopic finding was confirmed readily by means of a chemical test with Millon's reagent.

Penicillin and Caries Activity. H. A. Zander and B. G. Bibby.

In vitro studies showed that 10 units of penicillin interfered with carbohydrate fermentation in saliva-glucose mixtures. *In vivo* studies with a mouthwash containing 1,000 units of penicillin demonstrated that the capacity of saliva to ferment carbohydrates is eliminated for several hours by the use of the penicillin mouthwash.

In a controlled experiment the brushing of penicillin mixtures on the teeth of hamsters virtually prevented dental caries.

The findings offer evidence that the fermentation of carbohydrates by oral micro-organisms is important in the causation of dental caries.

Effects of Topical Sodium Fluoride in the Mandibular Teeth. A. L. Russell.

This report is a statistical analysis of a survey described by Knutson, Armstrong and Feldman (Pub. Health Rep. 62:425, March 21, 1947). The results of a two-year study of 1,458 Minnesota elementary school children given two, four or six treatments with topical sodium fluoride without a prior prophylaxis indicate that the presumably untreated control quadrants became more resistant to den-

tal caries in proportion to the number of treatments given the opposite side. This effect was more marked in the mandibular teeth, where the odds against chance occurrence are approximately 200 to 1. No such effect was detected in an earlier study by two of the same investigators, in which comparable children were given treatments by the same technic except for the inclusion of a prior prophylaxis and in which a group of wholly untreated children was utilized as an additional control.

A Determination of the Number of Surfaces Involved in Carious Extracted Teeth. Kenneth E. Wessels and Virgil D. Cheyne.

Three hundred and seventy-seven extracted deciduous and permanent teeth were examined to determine the number of surfaces involved by caries. Each tooth considered for this study was subjected to a detailed clinical examination, and only those teeth which were extracted because of caries were included in the report.

Data on carious surfaces of extracted teeth are presented according to sex, tooth type and age. The mean number of tooth surfaces involved with noncarious enamel lesions, enamel caries and dentinal caries is listed for each tooth type. The mean number of surfaces involved in the group of boys' permanent teeth is 4.378; in the boys' deciduous teeth, 4.096; in the girls' permanent teeth, 4.333; in the girls' deciduous teeth, 4.026.

In comparing group means, a significant difference is found only between the groups of boys' permanent and deciduous teeth. The mean value for all first permanent molars is 4.340 surfaces, compared with a mean value of 4.470 for the remainder of the permanent teeth included in the study. This difference is not significant.

For an accurate caries analysis, missing teeth must have the proper evaluation in relation to the remaining carious and filled teeth. Such a figure has been presented in this paper, and additional consideration is given to individual types of teeth according to sex and age.

The Role of Oxalates in Rat Dental Caries. C. A. Schlack, S. R. Howell, B. L. Taylor, V. J. Berzinskas and M. H. Aborn.

Investigators have shown that oxalic acid and oxalates leave a deposit on the teeth of rats which protects the enamel from etching by acid beverages. It also has been observed that dental caries is seldom found under calculus in human teeth, and there is some evidence that oxalates play a role in calculus deposition.

This study was undertaken to determine the effect of oxalates on the caries process in rats. One hundred and sixty-five weanling white rat litter mates were divided into five major groups. Each of these groups was further divided into three subgroups. Subgroup A in each of the major groups acted as a control and received a caries-producing diet of coarse corn meal, whole milk powder, alfalfa meal and salt.

In group 1, subgroup B received 0.02 per cent, and subgroup C, 0.11 per cent sodium oxalate in the caries diet. The caries diet of subgroup B, group 2, contained 0.06 per cent, and subgroup C, 0.33 per cent sodium oxalate. Rats of group 3 in subgroup B received a caries diet containing 1.6 per cent and in subgroup C, 8.0 per cent dehydrated spinach. Subgroups B and C of groups 4 and 5 received Purina lab chow and distilled drinking water containing 0.2 per cent and 0.22 per cent potassium oxalate in group 4; and 0.0002 per cent and 0.002 per cent potassium oxalate in group 5, ten days prior to being placed on the caries-producing diet. The oxalate drinking water was continued through the entire experimental period. All groups remained on the caries dietary for a hundred days.

Added dietary oxalates were found to produce no significant effect on caries incidence or extent. Although a considerable amount of calculus-like deposit occurred within the grooves of the molars of the experimental rats, the occurrence of caries in these susceptible areas was not affected.

These results tend to minimize the importance of the acidogenic factor in the initial stages of the dental caries process.

LIST OF DENTAL OFFICERS

SEPARATED FROM ARMY DENTAL CORPS

THE following list of dental officers separated from the Army Dental Corps does not include rank because such information is no longer furnished by the Surgeon General's Office. Publication will be given to other names as soon as possible.

Alabama	
Birmingham	Jones, Thomas W.
Birmingham	Weinstein, Leon E.
Arizona	
Wickenberg	Woodson, James D.
Arkansas	
Clinton	Sneed, Albert J.
Burmuda	
Pembroke	Byron, Hubert H.
California	
Alameda	Gardner, Allen J.
Alhambra	Larson, Harold R.
Altadena	Coates, George L.
Berkeley	Makower, Theodore
Crockett	Merrill, Elbert E.
Glendale	Cochran, Melvin L.
Glendale	Kunkel, Spurgeon R.
Livermore	Hector, George A.
Los Angeles	Cogen, Leo L.
Los Angeles	Shulman, Israel M.
Los Angeles	Snow, Douglas F.
Merced	Vaughn, James H.
Monrovia	Aitchison, James R.
Palo Alto	McGrillis, William W.
Pasadena	Musgrave, William A.
San Diego	Grosso, Fred J.
San Francisco	Astrahantseff, Boris P.
San Francisco	Corin, Phillip E.
San Francisco	Daniels, Kenneth W.
San Francisco	Epstein, Eddie
San Francisco	Howard, Richard L.
San Francisco	Linehan, Lloyd E.
San Francisco	Salinas, Carlos A.
San Pedro	Lande, Robert F.
Colorado	
Denver	Revis, George
Durango	Parker, Schuyler C.
Fort Logan	Snoddy, William H.
Salida	Alexander, Robert B.
Connecticut	
Bridgeport	Ruby, Robert J.
Bridgeport	Vecchiolia, Leo R.
Greenwich	Quitt, Leonard E.
New Haven	Cohen, Shepard N.
New Haven	Gabriele, Anthony W.
New Haven	Scialabba, James D.
Uncasville	Weisler, Herman L.
Wallingford	Craig, Theodore H.
District of Columbia	
Washington	Lady, David F.
Washington	McIver, Alton R.
Florida	
Cocoa	Akridge, Nicholas J.
Deland	Braboy, Leonidas A.
Graceville	Miller, Frank J.
Miami	Christiansen, Clyde C.
Georgia	
Marietta	Bailey, Thomas S.
Idaho	
Rexburg	Gill, Gerald P.
Illinois	
Anna	Mattheis, Ralph E., Jr.
Bloomington	Pitzer, Errington E.
Champaign	Wise, Thomas A.
Chicago	Bernstein, Walter
Chicago	Breger, Samuel M.
Chicago	Dangremond, Edwin H.
Chicago	Gierz, Alfred A.
Chicago	Goff, Kenneth S.
Chicago	Goldberg, Samuel L.
Chicago	Jones, Leslie F.
Chicago	Keck, Robert A.
Chicago	Kirts, Wesley M.
Chicago	Paliulis, Peter M.
Chicago Heights	Grossi, Ezio E.
Cicero	Wright, Warren F.
Jerseyville	Beach, Thornton A.
Lewistown	Welch, Jack W.
Maywood	Glerum, Donald J.
Maywood	Logsdon, Cale M.
Naperville	Hofert, Herbert J.
North Chicago	Feuerlicht, Henry D.
Peoria	Bennett, Everett W.
Indiana	
Elwood	Beavers, Thomas H.
Evansville	Bromm, Edward A., Jr.
Fort Branch	Pierce, James G.
Fort Wayne	Glassley, Richard C.
Fort Wayne	Weinraub, Irvin I.
Goshen	Bechtel, Kermit R.
Indianapolis	Ishler, Anscel I.
Indianapolis	Watson, Howard B.
Oakland City	Beall, Marvin E., Jr.

Iowa

Booneville	Shambaugh, Gordon I.
Council Bluffs	Marsh, Eugene L.
Dubuque	Biehl, Nicholas V.
Earlham	Kelsey, Robert M.

Kansas

Chanute	Brown, Herbert H.
Leavenworth	Mullen, James S.
Parsons	Donnelly, Hubert J. P.

Kentucky

Louisville	Rosenthal, Leonard
Louisville	Schuppert, Frank A., Jr.
Southgate	Heitz, Edward, Jr.

Louisiana

Baton Rouge	Anderson, Dupuy H.
Dry Prong	Donaldson, Kerwin V.
Jefferson Parish	Bosch, Julius J.
Morganza	Plauche, Ferdinand F.
New Orleans	Grau, Adolph E.
New Orleans	Smira, Albert G.

Maryland

Annapolis	Milliken, Lyman F.
Baltimore	Badger, Walter L.
Baltimore	Johnson, Roy C.
Baltimore	Mimeles, Meyer

Massachusetts

Boston	Lambrukos, Charles T.
Brookline	Ford, Thomas J. F.
Mattapan	Alexander, Lawrence G.
Melrose	Hall, Gordon
Milton	Catani, Carl L.
North Dighton	Latimer, Hal F. L.
Quincy	Bellevue, Charles J., Jr.
Springfield	Saffer, Ralph M.
Winchester	Millican, Leonard L.
Worcester	Hornbaker, David W.

Michigan

Grand Rapids	Kawka, Thomas J.

Minnesota

Argyle	Brekke, Charles A.
Atwater	Johnson, LeRoy
Fergus Falls	Veden, Frank W.
Hibbing	Gleason, George A.
Keewatin	Jensen, Howard K.
Minneapolis	Brown, Frederick C.
St. Paul	DeLange, John R.
St. Paul	Eckels, Donald V.
St. Paul	Engdahl, Theodore N., II

Mississippi

Grenada	Bailey, Clifford K., Jr.

Missouri

Centralia	Focht, Richard B.
Rockport	Campbell, Elvis S.
St. Louis	Leverich, Ruluff F.
St. Louis	Mahr, Raymond A.
Webb City	Faubion, Noel J.

Montana

Red Lodge	Schwin, Fred R.

Nebraska

Lincoln	Pollard, Jesse C.

New Hampshire

Manchester	Cote, Elphege J.

New Jersey

Belleville	Burde, Palmer D.
Boonton	Sikora, William P.
Clifton	DeRose, Dante A.
Glassboro	Shpeen, Harold
Hackensack	Van Ost, John R.
Jersey City	Devlin, Francis P.
Jersey City	Goldberg, Robert H.
Jersey City	Greenberg, Murray
Jersey City	Miller, John F.
Jersey City	Neubauer, Emory R.
Lyndhurst	Kale, Jacob N.
Newark	Gross, Seymour
Newark	Shpiner, Carl B.
Orange	Lansing, Harold J.
Paterson	Rowland, Robert B.
Perth Amboy	Weiss, Albert A.
Rahway	Weiner, Morris
South Amboy	Goldberger, Howard K.

New York

Albany	Sorkin, Isadore M.
Andover	Common, John R.
Arverne	Kahn, Harold
Bronx	Adelson, Max
Bronx	Posner, Harold W.
Bronx	Richman, Philip
Bronx	Rosenthal, Julius B.
Brooklyn	Barth, Nathan
Brooklyn	Bernstein, Leonard B.
Brooklyn	Boris, Victor H.
Brooklyn	Brancaccio, Armand R.
Brooklyn	Fisher, Charles B.
Brooklyn	Gordon, Sydney G.
Brooklyn	Gross, Solomon
Brooklyn	Jurow, Lester
Brooklyn	Lachnicht, Vitus J.
Brooklyn	Lewis, Nathan A.
Brooklyn	McAveney, William J., Jr.
Brooklyn	Moskowitz, Robert L.
Brooklyn	Romm, Henry S.
Brooklyn	Rosenbaum, Abraham A.
Brooklyn	Schwalb, Richard A.
Brooklyn	Smith, David J.
Brooklyn	Vogel, Irving A.
Brooklyn	Winter, Eugene A.
Buffalo	Roth, Joseph A.
Buffalo	Weinbach, William J.
Flushing	Manford, Julies
Freeport	Weinberg, Bernard D.
Huntington	Milstein, Morris
Jamaica	Weissman, Seymour
Long Island City	Orfanos, George P.
New York	Basewitz, David
New York	Bergman, John E.
New York	Breiter, Irving M.
New York	Eichner, Herbert J.
New York	Elliott, Walter G.
New York	Fekete, Andrew J.
New York	Greenberg, Morton
New York	Janoff, Gerald
New York	Latucha, Albert

New York	Selman, Abbe J.
New York	Silver, Irving S.
New York	Sirna, Lawrence E.
New York	Weinrib, Morton C.
New York	Weiss, Daniel A.
New York	Zuckerman, David C.
New York Mills	Czyzycki, Mathew J.
Peekskill	Borg, Harry V.
Port Jefferson Station	Chernoff, Leon H.
Rockaway Beach	Conolly, Thomas J., Jr.
Rockaway Beach	Hartstein, Harold
Schenectady	Shapiro, Edward P.
Sloatsburg	Rozum, Joseph I.
Syracuse	Sall, Hymie D.

North Carolina

Charlotte	Galarde, Arden J.

North Dakota

Bismarck	Cole, Walter E.

Ohio

Cleveland	Braun, Howard G.
Cleveland	Lewis, Stanley J.
Fairport Harbor	Gurley, Joseph A.
Lancaster	Bruney, John L.
Lancaster	Embrey, Nelson R.
Poulding	Dvorak, Alois F.
University Heights	Forman, Sidney
Zanesville	Smith, William M.

Oklahoma

Yukon	Sanger, Edwin E.

Oregon

Portland	Finnell, Charles A.

Panama Canal Zone

Ancon	Cagle, Tyler W.
Balboa Heights	Bell, Walter H.

Pennsylvania

Allentown	Flannery, Glenn M.
Beaver Falls	Coon, James L.
Centralia	Miller, James S.
Chester	Kendall, Charles G.
Erie	Walach, Michael E.
Fayette	Moser, Jesse L.
Harrisburg	Bordner, Stanton N.
Mercer	Miller, Harry P.
Mohnton	Leininger, Thomas H.
Munhall	Rosenbaum, Harry
New Castle	McBride, Edwin F.
New Freedom	Minnich, William H.
York County	
Palmerton	Roth, Douglas A.
Philadelphia	Boccella, Ralph F.
Philadelphia	Brody, Jack
Philadelphia	Gravitz, Sidney
Philadelphia	Green, Edward L.
Philadelphia	Greenberg, Bernard
Philadelphia	Pearlman, Martin W.
Philadelphia	Wagman, Sydney S.
Philadelphia	Weiss, Harold G.
Pittsburgh	Bernfeld, Myer
Pittsburgh	Briney, Alonzo T.
Pittsburgh	Hoskin, Robert O.
Pittston	Marnell, Joseph P.
Tarentum	Gestner, Norbert J., Jr.
Tresckow	Bonacci, Victor R.
Wilkes-Barre	Miller, Marcus E.

Puerto Rico

Caguas	Diaz-Marxuach, Elpido
Guayama	Rovira, Benjamin D.
Penuelas	Loyola, Cesar A.
San Sebastian	DeJesus, Lemuel G.
Santurce	Daubon, Druso A.
Yabucoa	Berrios, Nestor M.

Rhode Island

Cranston	Moretti, Vincent J.
Westerly	Celestino, Frank S.

South Dakota

Watertown	Mickelson, Warden E.

Tennessee

Memphis	Black, Robert O., Jr.
Mountain Home	Talbert, Harry V.

Texas

Amarillo	Garre, Larry R.
Dallas	Light, Sidney S.
Houston	Davis, Chester L.
San Antonio	Van Wie, Stonewall, Jr.

Utah

Salt Lake City	Hale, Edward G.
Salt Lake City	Harrison, Clint H.

Virginia

Portsmouth	Bonnie, Herbert H.
Richmond	Toombs, Subbeal C.
Richmond	Woolard, Charles H.

Washington

Seattle	Kanemori, Shigetada F.
Spokane	James, Ralph S.

West Virginia

Beckley	Callaway, John S.
Clarksburg	Ruck, William H., Jr.
Hamlin	Wilkerson, Charles L.
Lewisburg	Brown, Ival H.
Taplin	Snow, David K.

Wisconsin

Appleton	Grossman, Walter A.
Brandon	Jost, Loyd G.
Cudahy	Kukor, Joseph F.
Madison	Margetis, Peter M.
Milwaukee	Baumann, Frederick C.
Milwaukee	Frye, Thomas E.
Richland Center	Ewers, Scott H.

DEATHS

Argue, John E., Seattle; College of Dentistry, University of Minnesota, 1899; died November 16; aged 67.

Bailey, R. C., Harrisburg, Pa.; died November 21; aged 43.

Barnes, L. Lee, Oklahoma City; died November 24; aged 69.

Bird, Willard J., Watertown, Mass.; died November 4.

Blair, Marion E., Coldwater, Mich.; died December 2; aged 83.

Booth, John A., Sr., Nephi, Utah; died October 26; aged 85.

Bradley, J. M., St. Petersburg, Fla.; Ohio College of Dental Surgery, Dental Department of the University of Cincinnati, 1907; died November 20; aged 69.

Brown, Isaac, New York; College of Dental and Oral Surgery of New York, 1908; died November 23; aged 68.

Calder, Ernest S., Providence, R. I.; Dental School, Harvard University, 1908; died November 28; aged 61.

Campbell, Claude M., Columbus, Ohio; College of Dentistry, Ohio State University, 1918; died November 13; aged 57.

Case, Clinton E., Brookville, Ind.; Ohio College of Dental Surgery, University of Cincinnati, 1891; died November 14; aged 80.

Clayton, B. W., Nowata, Okla.; died October 1; aged 72.

Clayton, Furman, Hendersonville, N. C.; New York College of Dentistry, 1886; died November 19; aged 84.

Cooper, David E., Camden, N. J.; Medico-Chirurgical College of Philadelphia, 1916; died November 10; aged 53.

Davis, Edwin E., Quincy, Mass.; Tufts College Dental School, 1883; died November 9; aged 89.

Downs, James R., Ridgway, Pa.; died November 18; aged 37.

Ellis, Walter L., Lake Wales, Fla.; School of Dentistry, Vanderbilt University, 1909; died November 2; aged 65.

Eveland, Roy H., Minneapolis; School of Dentistry, University of Minnesota, 1914; died December 2.

Fairtile, Clarence M., Fall River, Mass.; Philadelphia Dental College, 1903; died November 27; aged 67.

Forestner, George J., East St. Louis; Cincinnati College of Dental Surgery, 1903; died November 17; aged 73.

Gamboe, Walter, Louisville, Ky.; Louisville College of Dentistry of Centre College, 1913; died November 23; aged 63.

Granger, Frank, Flint, Mich.; College of Dentistry, University of Illinois, 1904; died November 17; aged 68.

Gravin, Leif, Chicago; died December 5; aged 52.

Groscurth, John H., Jeffersonville, Ind.; School of Dentistry, University of Louisville, 1900; died November 13; aged 78.

Hewes, Linnell T., Houlton, Me.; died November 26; aged 64.

Hill, David A., Keansburg, N. J.; New York College of Dentistry, 1901; died October 29; aged 68.

Hill, Wade S., Sr., Logan, W. Va.; Louisville College of Dentistry of Centre College, 1918; died November 17; aged 60.

Hoy, Joseph, Fall River, Mass.; died December 8; aged 55.

Jackson, Harvey N., San Diego, Calif.; School of Dentistry, University of Pennsylvania, 1890; died November 16; aged 80.

Joseph, Isaac E., Louisville, Ky.; died November 20; aged 83.

Kershaw, Everett R., Providence, R. I.; Tufts College Dental School, 1943; died November 13; aged 29.

Kiernan, Thomas A., Jersey City, N. J.; New York College of Dentistry, 1893; died December 3; aged 76.

Kilpatrick, J. J., Bellefonte, Pa.; School of Dentistry, University of Pennsylvania, 1900; died November 3; aged 71.

Leaman, Walter J., Lancaster, Pa.; died November 11; aged 73.

Lord, Clifton E., Mt. Holly, N. J.; School of Dentistry, University of Pennsylvania, 1900; died November 20; aged 72.

Maneely, D. K., Hampton, Iowa; College of Dentistry, University of Iowa, 1923; died November 14; aged 49.

Manent, Malcolm C., New Orleans; School of Dentistry, Loyola University, 1930; died November 2; aged 44.

Maresh, Reginald, Cedar Rapids, Iowa; College of Dentistry, University of Iowa, 1904; died November 29; aged 64.

Marschalk, Leighton V., Washington, D. C.; Dental Department, George Washington University, 1905; died November 5.

Marshall, E. H., Kenyon, Minn.; died in December; aged 83.

Mellen, Kenneth J., Buffalo; School of Dentistry, University of Buffalo, 1923; died November 28; aged 48.

Minger, Rudy E., Glendale, Calif.; College of Dentistry, University of Iowa, 1915; died November 24; aged 54.

Mitchell, David L., Neosho, Mo.; School of Dentistry, Washington University, 1916; died November 23; aged 65.

Muller, Harold C., Scarsdale, N. Y.; died November 20; aged 44.

Murray, William G., Herkimer, N. Y.; Philadelphia Dental College, Temple University, 1896; died December 6.

Nicholson, E. N., Hooker, Okla.; died October 27.

Nielsen, Carl O., Ephraim, Utah; died October 22; aged 74.

Pierson, L. G., Selma, Ala.; School of Dentistry, Vanderbilt University, 1898; died November 10.

Pike, Charles, Chicago; died November 15.

Prechel, A. E., La Crosse, Wis.; College of Dentistry, University of Minnesota, 1920; died November 27; aged 48.

Preston, Arthur E., Lockport, N. Y.; Philadelphia Dental College, 1894; died November 22; aged 84.

Rawson, George H., Jersey City, N. J.; School of Dental and Oral Surgery, Columbia University, 1919; died November 5; aged 49.

Ray, Eugene C., Noblesville, Ind.; School of Dentistry, Indiana University, 1919; died December 14; aged 49.

Richardson, H. N., Shenandoah, Iowa; died December 12; aged 76.

Richter, A. Leo, Milwaukee; died November 27; aged 81.

Robson, T. W., Whitehall, Mich.; Department of Dental Surgery, Detroit College of Medicine, 1900; died November 28; aged 71.

Ronalds, Joe G., Mt. Carmel, Ill.; College of Dentistry, University of Illinois, 1935; died November 29; aged 39.

Rosenbluth, Harold, Richmond Hill, N. Y.; College of Dentistry, University of Tennessee, 1919; died November 10; aged 51.

Rust, Austin J., Sr., Ladue, Mo.; died November 5; aged 61.

Ryan, Clarence M., Syracuse, N. Y.; Baltimore College of Dental Surgery, 1898; died November 28; aged 77.

Schroers, Ernest, Fulton, Mo.; Kansas City Dental College, 1907; died November 17; aged 87.

Scranton, Samuel A., Schoharie, N. Y.; New York College of Dentistry, 1897; died September 26; aged 72.

Shepler, Howard H., Melrose Park, Pa.; Pennsylvania College of Dental Surgery, 1905; died November 13; aged 67.

Simpson, Frank P., Pittsfield, Mass.; Harvard University Dental School, 1903; died November 10; aged 73.

Smith, E. A., Montclair, N. J.; Philadelphia Dental College, 1896; died December 8.

Snow, Frank R., Kalamazoo, Mich.; College of Dental Surgery, University of Michigan, 1902; died December 2.

Spurgeon, Ray, Columbus, Ohio; College of Dentistry, Ohio Medical University, 1905; died November 24; aged 64.

Stastney, Rudolph E., Chicago; died November 1.

Stone, P. L., Cumberland Gap, Tenn.; Louisville College of Dentistry of Centre College, 1901; died November 22.

Strange, E. B., Hillsboro, Ill.; School of Dentistry, St. Louis University, 1905; died November 19; aged 69.

Tate, Arthur B., Little Rock, Ark.; died November 6; aged 67.

Tieman, Leon, Quincy, Ill.; School of Dentistry, St. Louis University, 1905; died December 3; aged 64.

White, Clarence A., Indianapolis; Harvard University Dental School, 1923; died December 1; aged 50.

Woolard, George W., Alton, Ill.; died December 1; aged 62.

Yarnell, Edgar P., Versailles, Mo.; Kansas City-Western Dental College, 1899; died November 20; aged 71.

DIRECTORY

Officers

H. B. Washburn, President.....Lowry Bldg., St. Paul
Clyde E. Minges, President-Elect.....Peoples Bank Bldg., Rocky Mount, N. C.
Philip E. Adams, First Vice-President.....106 Marlborough St., Boston
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ANNOUNCEMENTS

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	April 15-17	Birmingham	G. W. Matthews	1922 Tenth Ave., S., Birmingham 3
Arizona	April 22-24	Phoenix	B. K. Litt	68 E. Congress, Tucson
Arkansas	May 2-5	Little Rock	D. M. Hamm	Clarksville
California	April 26-28	San Francisco	L. E. Linehan	450 Sutter St., San Francisco
S. California	March 29-31	Los Angeles	M. E. Ralston	903 Crenshaw Bldg., Los Angeles 6
Colorado	June 14-16	Glenwood Springs	R. A. Downs	724 Republic Bldg., Denver 2
Connecticut	May 19-21	Hartford	E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware			J. Krygier	309 S. State St., Dover
D. of Columbia	March 14-18	Washington	K. H. Wood	202-1835 Eye St., N. W., Washington
Florida			J. I. Todd	433 St. James Bldg., Jacksonville
Georgia	Oct. 13-15	Augusta	J. M. Heard, Jr.	Persons Bldg., Macon
Hawaii	Oct. 28-31	Lihue	J. H. Dawe	P. O. Box 39, Honolulu 10
Idaho			R. Sutcliff	Twin Falls
Illinois	May 20-22	Springfield	P. W. Clopper	623 Jefferson Bldg., Peoria 2
Indiana	May 17-19	Indianapolis	L. E. Ewbank	Kingman
Iowa	May 3-5	Des Moines	A. N. Humiston	417 Higley Bldg., Cedar Rapids
Kansas	May 2-5	Wichita	F. A. Richmond	1008 Huron Bldg., Kansas City
Kentucky	April 5-7	Louisville	J. L. Walker	640 Barbee Way, S., Louisville
Louisiana	April 8-10	Alexandria	J. S. Bernhard	407 Medical Arts Bldg., Shreveport
Maine	June 6-8	Portland Springs	P. W. Anderson	32 Deering St., Portland
Maryland	May 3-5	Baltimore	J. H. Shackelford	706 Baltimore Life Bldg., Baltimore 1
Massachusetts	May 3-6	Boston	P. E. Adams	227 Commonwealth Ave., Boston 16
Michigan	April 12-14	Detroit	F. Wertheimer	Michigan Department of Health, Lansing
Minnesota	Feb. 23-25	St. Paul	C. V. E. Cassel	Lowry Medical Arts Bldg., St. Paul
Mississippi	May 31-June 2	Biloxi	F. C. Sneed	Osyka
Missouri	April 25-28	Jefferson City	C. W. Digges	Exchange National Bank Bldg., Columbia
Montana	May 6-8	Great Falls	C. S. Renouard	305 Phoenix Bldg., Butte
Nebraska	May 10-12	Omaha	F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada			L. G. Jacob	505 Chestnut St., Reno
New Hampshire	June 27-29	Jefferson	F. E. Williams	814 Elm St., Manchester
New Jersey	April 20-23	Atlantic City	J. G. Carr	407 Cooper St., Camden
New Mexico	May 24-26	Santa Fe	J. S. Eilar	First National Bank Bldg., Albuquerque
New York	May 10-13	Syracuse	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	April 26-28	Asheville	R. F. Hunt	Rocky Mount
North Dakota	May 9-12	Minot	A. L. Smeby	Northwood
Ohio	Nov. 7-10	Columbus	E. G. Jones	185 E. State St., Columbus
Oklahoma	April 11-14	Tulsa	E. W. Wise	Medical Arts Bldg., Tulsa
Oregon	Feb. 5-7	Portland	W. H. Hurley	407 Selling Bldg., Portland 5
Panama Canal Zone			T. W. Cagle	Box 243, Cocoli
Pennsylvania	May 11-13	Atlantic City, N.J.	E. R. Aston	421 Market St., Kingston
Philippine I.			G. A. Carreon	9 Broadway, Third St., N. Manila
Puerto Rico			R. Miranda	Box 747, Rio Piedras
Rhode Island			S. Ozarin	172 Thames St., Newport
South Carolina	May 2-4	Greenville	J. R. Owings	201 E. North St., Greenville
South Dakota	May 9-11	Sioux Falls	E. W. Elmen	Sioux Falls
Tennessee	May 24-27	Memphis	E. J. Justis	Exchange Bldg., Memphis
Texas	April 12-15	Fort Worth	W. Ogle	313 Medical Arts Bldg., Dallas
Utah			S. Ballinger	1001 Tribune-Telegram Bldg., Salt Lake City
Vermont	May 23-25	Woodstock	J. A. Larrow	Middlebury
Virginia	April 12-14	Richmond	J. E. John	804 Medical Arts Bldg., Roanoke
Washington			F. J. Dingler	1502 Medical & Dental Bldg., Seattle 1
West Virginia	May 20-22	Clarksburg	C. J. Gavelda	Clarksburg
Wisconsin	March 30-April 1	Milwaukee	R. A. Mason	964 N. 27th St., Milwaukee
Wyoming			J. D. McNiff	208 Grand Ave., Laramie

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Arizona	March 31-April 3	Phoenix	R. K. Trueblood	25 N. Second Ave., Glendale
California	Feb. 9 June 14 July 26	San Francisco Los Angeles San Francisco	K. I. Nesbitt	Room 203, 515 Van Ness Ave., San Francisco 2
Iowa	March 8-12	Iowa City	W. L. Bierring	Department of Health Des Moines
Maine	Feb. 29-March 1	Augusta	R. A. Derbyshire	Box 387, Skowhegan
Massachusetts	Feb. 3-5	Boston	J. C. Wilson	413 N. State House, Boston
Michigan	Feb. 2	Ann Arbor	J. L. Champagne	502 David Whitney Bldg., Detroit 26
Mississippi	June 15		M. B. Pearce	New Albany
North Carolina	June 28-July 1	Raleigh	F. O. Alford	1109 Liberty Life Bldg., Charlotte 2
Ohio	March 22-27 June 28-July 3*	Columbus Cleveland	E. D. Lowry	79 E. State St., Columbus
West Virginia	June 21-24		R. H. Davis	510-16 Goff Bldg., Clarksburg
Wisconsin	Feb. 16-20	Milwaukee	S. F. Donovan	Tomah

*Dental and dental hygiene examination.

OTHER MEETINGS

Name	Date	City	Secy. or Chm.	Address
Akron Dental Society Eighth Annual Children's Dental Health Week	Feb. 1-7	Akron	L. A. Graham Chm.	405 E. Cuyahoga Falls Ave., Akron
American Academy of Oral Pathology, Second Annual Meeting	Feb. 8	Chicago	H. B. G. Robinson Editor	College of Dentistry, Ohio State University, Columbus 10
American Association of Dental Editors	Feb. 8	Chicago	G. R. Spalding Secy.	555 W. Maple Ave., Birmingham, Mich.
American Association of Endodontists	Feb. 7-8	Chicago	M. K. Hine Pres.	1121 W. Michigan St., Indianapolis 2
American Association of Orthodontists	April 27-29	Columbus	M. E. Ernst Secy.	1250 Lowry Medical Arts Bldg., St. Paul
American Board of Orthodontics	April 23-26	Columbus	B. G. deVries Secy.	705 Medical Arts Bldg., Minneapolis 2
American Dental Association, Eighty-Ninth Annual Meeting	Sept. 13-17	Chicago	H. Hillenbrand Secy.	222 E. Superior St., Chicago 11
American Dental Society of Europe	July 27-30	London	K. C. Campbell Secy.	88 Portland Place, London, W. 1
American Society for the Advancement of General Anesthesia in Dentistry	March 22	New York	M. H. Feldman Secy.	730 Fifth Ave., New York
Chicago Dental Society	Feb. 9-12	Chicago	A. L. Brett Secy.	30 N. Michigan Ave., Chicago 2
Cincinnati Dental Society March Clinic Meeting and Children's Dental Health Day	March 14-16	Cincinnati	R. L. Holle	Doctors Bldg., Cincinnati 2
Cleveland Dental Society, Annual Spring Clinic Meeting	May 3-5	Cleveland	P. J. Warren Pub. Chm.	14805 Detroit Ave., Cleveland 15
Greater Philadelphia Annual Meeting	Feb. 4-6	Philadelphia	R. Adams Secy.	501 Stock Exchange Bldg., 1411 Walnut St., Philadelphia 2
National Board of Dental Examiners	April 12-13†		G. L. Teall Secy.	Box 71, Hiawatha, Kan.
Northeastern Society of Orthodontists	March 1-2	Atlantic City N. J.	O. Jacobson Secy.	35 W. 81st St., New York
Northwest Conference in Dental Medicine	April 25-30	Sun Valley	A. A. Litscher Secy.	1064 Paulsen M & D Bldg., Spokane
Ontario Dental Association Convention, Eighty-First Annual Meeting	May 17-19	Toronto	G. T. Mitton Secy.	86 Bloor St., West, Toronto

Name	Date	Place	Secretary	Address
Third All India Dental Conference	Feb. 19-22	Bombay	H. D. Merchant Organizing Secy.	Reception Committee, All India Dental Conference, 1948, Sambava Chambers, Sir Phirozshah Mehta Road, Bombay 1
Thomas P. Hinman Mid-Winter Clinic	March 21-23	Atlanta, Ga.	F. A. Daniel Gen. Chm.	1023 Doctors Bldg., Atlanta 3, Ga.
Washington University Dental Alumni, Eighty-Second Annual Meeting	March 5-6	St. Louis	V. P. Thompson Secy.	234 W. Lockwood, Webster Groves 19, Mo.

†Examinations will be held in schools where there are five or more candidates.

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Boston City Hospital, Boston. Oral Surgeon-in-Chief, Stephen P. Mallett.

The Children's and Infants' Hospital (a Unit) of Boston. Address Paul K. Losch, 300 Longwood Ave., Boston.

Children's Hospital, Pittsburgh. Address C. W. Hagan.

The Children's Memorial Hospital, Chicago. Administrator, Mabel W. Binner, 707 Fullerton Ave., Chicago.

City Memorial Hospital, Winston-Salem, N. C. Superintendent, J. B. Whittington.

Columbia University, School of Dental and Oral Surgery, New York. Associate Dean, Bion R. East, 630 W. 168th St., New York 32.

Delaware Hospital, Inc., Wilmington. Medical Director, Delaware Hospital, 501 W. Fourteenth St., Wilmington 13.

Eastman Dental Dispensary, Rochester, N. Y. Director, Basil G. Bibby.

Elizabeth Steele Magee Hospital, Pittsburgh. Address, W. Harry Archer, 804 Professional Bldg., Pittsburgh.

The Forsyth Dental Infirmary for Children, Boston. Director, Percy R. Howe, 140 The Fenway, Boston.

George F. Geisinger Memorial Hospital, Department of Oral and Maxillofacial Surgery, Danville, Pa. Address James B. Smith.

Hospital of the University of Pennsylvania, Philadelphia. Chief, Gladwyn Graham, Department of Oral Surgery, Philadelphia 4.

International Grenfell Association, New York. Staff Selection Committee, 156 Fifth Ave., New York.

Jewish Sanitarium and Hospital for Chronic Diseases, New York. Director, Leonard Kohn, Dental Division, E. Forty-Ninth St. and Rutland Road, Brooklyn 3, N. Y.

Joseph Samuels Dental Clinic of the Rhode Island Hospital, Providence.

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